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THE AGRICULTURAL GAZETTE OF CANADA

Vol. X May-June, 1923 No. 3

STORAGE

LEADING TOPICS

The Nappan Experimental Farm
Dominion Illustration Stations in Quebec
Salving a Tuberculous Dairy Herd
Mosquito Control
Mycological Problems in Manufacture and Construction
Standards for Canned Fruits and Vegetables
Legume Production in Manitoba
Field Crop Improvement in Saskatchewan
Marketing Services, Alberta
Early Laying—Its Economic Significance
High School Agriculture in Manitoba
Economics of Irrigation Practice

DEPARTMENT OF AGRICULTURE
OTTAWA, CANADA

The Agricultural Gazette of Canada is published bi-monthly, in English and in French, by the Dominion Department of Agriculture, Ottawa.

The aim of The Agricultural Gazette is to provide a source of information as to the policies and activities of the Dominion Department of Agriculture and of the Provincial Departments of Agriculture and of Education, so far as the work of the latter relates to Agricultural Education. Besides being a publicity medium, it constitutes a comprehensive record of the progress and development of departmental effort on behalf of Agriculture in Canada.

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A limited number of copies are available to subscribers at $1.00 per annum, or 20 cents per copy.

Subscriptions should be addressed to the Editor.

DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE
PUBLICATIONS BRANCH

Vol. 10: No. 3 May-June, 1923

The AGRICULTURAL GAZETTE
OF CANADA

J. B. SPENCER, Director of Publicity
Wm. B. VARLEY, Editor

Issued by authority of the Honourable W. R. Motherwell, Minister of Agriculture
OTTAWA

MAP OF CANADA SHOWING THE LOCATION OF FARMS, STATIONS AND SUB-STATIONS IN THE EXPERIMENTAL FARMS SYSTEM, THE AGRICULTURAL COLLEGES AND AGRICULTURAL SCHOOLS

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The AGRICULTURAL GAZETTE
OF CANADA

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THE NAPPAN EXPERIMENTAL FARM

By W. W. BAIRD, SUPERINTENDENT

THE Dominion Experimental Farm for Nova Scotia was established in 1888 at Nappan, in the county of Cumberland, about eight miles from the border line of New Brunswick, and on the main line of the Canadian National Railway running from Montreal to Halifax. It was one of the original farms established under the Act passed by the Dominion Parliament in 1886, authorizing the establishment of a Central Farm and four branches. It was first known as the Experimental Farm for the Maritime Provinces, the activities of the farm at that time being designed to meet the needs of the three Provinces. Later, Stations were established at Charlottetown, Prince Edward Island, Kentville, Nova Scotia and Fredericton, New Brunswick, and this farm has since been called the Experimental Farm for Nova Scotia.

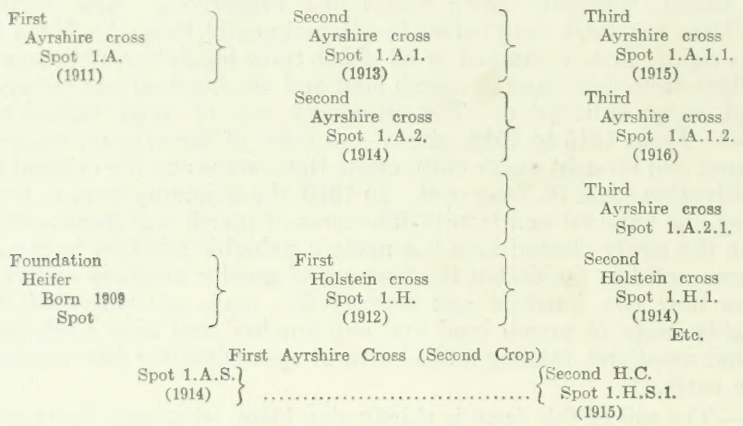
The original farm contained in all about three hundred acres, some forty-five of which were dyke land or marsh land and one hundred and twenty acres of upland under cultivation. The remainder was in rough unbroken land and woods. From 1915 to 1918, ninety-two acres of the original wooded area were cleared and brought under cultivation, thus increasing the original upland under cultivation some 76·7 per cent. In 1919, the adjoining farm to the south comprising one hundred and twenty-five acres of marsh was purchased. This farm with the newly cleared area has made a valuable addition to the experimental area and has facilitated the keeping of greater numbers of live stock. There are now two hundred and seventy-five acres of cultivated upland, about eighty acres of marsh land and one hundred and nine acres in rough pasture and woodland, making a total area of approximately four hundred and sixty-five acres.

Soil.—The soil of this farm is chiefly clay loam, with some parts gravelly, and with a subsoil varying from a heavy clay pan to gravelly clay with a limited area running from sandy to gravelly character. Some seventy or eighty acres of the heaviest clay have been underdrained with most beneficial results. A marked improvement has been noted in the texture of the soil on the underdrained areas. It can be worked from two to three weeks earlier in the spring, which in Eastern Canada, where the growing season is so short, is a valuable asset. The underdraining has made the heavier clay soils much easier to work, reducing the labour of preparing a seed bed for grain. This is most in evidence in a wet season for, if the heavy clay is not well dried out and is worked when damp, it will bake very hard and a poor seed bed results.

Live Stock.—Since the establishment of other Experimental Stations in the Maritime Provinces, and more particularly the Experimental Station at Kentville, N.S., where horticultural work is the main feature, it was thought expedient to make live stock and field crops the two main activities of this farm, the surrounding country lending its character to the development of these two phases to a much greater degree than to other branches of agriculture.

During the past eight years, the improvement of the common dairy cow by the use of the pure-bred sire has received a great deal of attention. In 1910, twelve heifers born in 1909, were purchased for the experiment, the object of this experiment being to collect data on the cash value of the pure-bred dairy sire on a herd of common or mixed breeding in the increased production of the progeny as well as their proportionately greater market value. The grade foundation heifers were first bred to an Ayrshire bull. From this first Ayrshire cross, 1 A's, breeding was carried along as for pure-breds, breeding the Ayrshire crosses always to a pure-bred Ayrshire bull. The next year the foundation herd was bred to a Holstein bull, yielding the first cross Holstein 1 H's. All progeny was bred to a bull of like breeding. All heifers were bred to freshen as near two years of age as possible and for fall calving. Each foundation heifer will, in her heifers, originate a family; hence her number has been incorporated into the number of all her progeny. The following diagram shows the possible progeny of each heifer in six successive years of breeding, making no allowance for losses and figuring that all progeny are females.

NOMENCLATURE OF PROGENY



Careful data have been collected on (*a*) Cost of rearing to first calving; (*b*) Cost of feeding for each lactation period; (*c*) Character and quantity of feeds for each lactation period; (*d*) Milk, fat and butter produced in each lactation period; (*e*) Profit produced in each lactation period; (*f*) Photographic records of each progeny of each foundation heifer which shows heredity as to quality, size and type.

While the experiment has not been completed, yet the data to date give some very interesting as well as valuable information. The first outstanding feature of this breeding test that impresses one is the marked influence a pure-bred sire has on the average grade herd of cows in transmitting to the progeny the breed characteristics, such as colour, size and conformation to type. These have been most marked in both Holsteins and Ayrshires. In Holsteins, colour marking has been as high as 98 per cent; in Ayrshires, 95 per cent. In breed type, Holsteins have scored 90 per cent, and Ayrshires, 85 per cent. In size, Holsteins have shown 96 per cent, and Ayrshires, 90 per cent.

As space will not permit of a detailed analysis of the results obtained from the production of the progeny compared with their dams, a short

summary will give in a general way the increased production from progeny over dams. The only fair basis of comparison is that of butter fat.

The data to date show that, in the case of first cross Ayrshires, 29.5 per cent are superior to their dams, covering a five-year period of production. In the case of second cross Ayrshires over a period of five years, 56 per cent were superior to their dams. In the case of third cross Ayrshires over a period of three years, 66.6 per cent were superior to their dams. It will be noted that a gradual increase has been obtained in each succeeding cross. In the case of first cross Holsteins covering a period of five years, 33.2 per cent were superior to dams in butter fat production. In the case of second cross Holsteins covering a period of three years, 90 per cent showed superiority to their dams.

One of the most important phases of this work is the results obtained by using a pure-bred sire of the right breed-type, having official qualifications for production in his ancestry, versus using a pure-bred sire of the right breed-type but not sufficiently qualified by official production in his ancestry. For example, bull No. 1 was one possessing good breed-type, but the official records show in his ancestry only 15 R.O.P. daughters, most of which were in the ancestry of the great grandsire. Daughters from this bull showed a decrease in milk production as well as per cent fat. The average production from the dams was 5,905 pounds milk, yielding 257.5 pounds butter-fat at a cost of 21.5 cents per pound, while the average production from their daughters was 4,315 pounds milk, yielding 164.5 pounds butter-fat at a cost of 29.5 cents per pound. Skim-milk was omitted in computing these costs per pound of butter-fat in all cases.

Bull No. 2 was one of good breed-type and had sufficient official qualifications in his ancestry to warrant a reasonably good increase in production in his progeny, having in his ancestry 114 R.O.P. daughters and 81 R.O.P. sons. Daughters from this bull back the guarantee by an increase in their production and per cent butter-fat over their dams. Their dams gave an average production of 4,647.5 pounds milk, yielding 181 pounds butter-fat at a cost of 26.5 cents per pound, while their daughters gave an average of 6,602.4 pounds milk, yielding 291.5 pounds butter-fat at a cost of 21 cents per pound. A decrease in cost of production of $5.50 per hundredweight in favour of the daughters from the bull with the qualifications of production in his ancestry is thus shown, against an increase in cost of production of $8 per hundredweight of butter-fat produced by the daughters from the bull with good breed-type but not sufficient qualifications in his ancestry to warrant a profitable improvement in progeny over dams.

The foregoing results are worthy of note from the standpoint of the breeder who is selecting his herd sire, whether he be intended for a grade herd or pure-bred herd. The application of the principle is the same, and one may expect similar results to follow such a selection.

The cost of milk production was computed over a period of nine years from the fore-mentioned grade herd, where no selection of females was made because all females were retained for experimental purposes. Consequently, this would tend to increase the cost of production as the poorer females would keep the average production low. Nevertheless, it is felt that these figures from a grade herd may be of interest and value to the breeder and feeder. The nine year average was as follows: Amount of different feeds required to produce 100 pounds milk was 37 pounds meal, 113 pounds roots, 80 pounds hay, and

35 pounds green feed at an average cost of $1.77 per hundredweight. The meal mixture was charged at $2.50 per hundredweight, roots at $3 per ton, hay at $12 per ton, green feed at $3 per ton and pasture at $2 per month.

A herd of Shorthorns, consisting of seven mature cows, two two-year old heifers, one yearling heifer and a herd bull was established at this farm during the season of 1920. The object of establishing this herd was threefold: First, to study problems relative to successful breeding and feeding of beef cattle and the application of such principles as have already been established. Second, to improve the beef stock in the district by demonstrations in breeding and development; also sale of good sires. Third, to ascertain the cost of production, which after all is one of the main factors in farming.

A foundation herd of pure-bred Guernseys made up of eight mature cows, three young females and a herd bull, was also established in 1920, the object of such being: First, to make a study of problems relating to successful breeding of pure-bred Guernseys; second, to aid in improving the breed by demonstration and sale of good sires; third, to study cost of production under present day conditions; fourth, to carry on Record of Performance work. Good progress has been made with both these herds, some very good individuals having been sold, and good individual records made. King's Blanche of Hillside made the following records in two successive years: first year, 12,230 pounds milk with an average test of 6.23 per cent, yielding 762 pounds fat; second year, 12,087.5 pounds milk with an average test of 6.2 per cent, yielding 749.42 pounds fat; making a total of 1,511.42 pounds in two 365-day lactation periods.

Sheep.—Another project carried out at this farm, bearing upon the same point of interest to the breeder as the grading up of dairy cows is the grading up of the average grade ewe by the use of pure-bred sires. In 1917, a number of average grade ewes were purchased and bred to a good ram, possessing not only good breed-type but an excellent fleece of wool. Other rams used on the progeny were equally as good. The following were the results: The grade ewes gave a wool clip that averaged six and one-quarter pounds per fleece. Their progeny yielded a wool clip that averaged eight and nine-twentieths pounds per fleece, which graded 85·6 per cent medium combing, 11·6 per cent low medium, and 2·8 per cent low combing. Their progeny in turn gave an average wool clip of eight and five-sevenths pounds per fleece, grading 85·5 per cent medium combing, 11·7 per cent low medium, and 3·4 per cent low combing, showing an increase in three years of nearly two and five-eighths pounds per fleece. To the breeder having a flock of 100 ewes, this would mean an increase in production of 262·5 pounds wool, which figured at 30 cents per pound would realize a net increase profit from the flock of $78.75.

The foregoing results are indicative of the fact that cheap sires are dear sires at any price, and that good sires with official qualifications in ancestry are cheap sires at any reasonable figure.

Swine.—Swine breeding has also received much attention at this farm, two herds being maintained, namely Yorkshires and Berkshires. The object in maintaining these herds is twofold, first to collect data on cost of production under present day conditions, and, second, to supply good breeding stock so that the stock

may be improved and greater profits realized.

Last year, the average feed cost for maintaining a herd of twelve brood sows was $407.64 or $33.97 per sow. Nine Yorkshire sows gave an average of 10·4 pigs per litter and raised an average of 8·12 at a feed cost of $2.35 per pig at six weeks of age. The average market value was $59.93 per litter or $7.32 per pig at six weeks of age. The average profit realized per sow over feed cost was $72.52. It may be well to mention that all sows except two produced two litters within the year. The cost of pork production for the same period was $8.57 per hundredweight of gain. The amount of different feeds required to produce a pound of gain was 3·6 pounds meal, 1·9 pounds roots and 1·35 pounds skim-milk. Data on cost of production will be secured over a period of years in order to strike a mean average cost of production.

Poultry.—Similar work to that of live stock is being carried on with poultry. Figures are being collected to show the value of using cockerels selected from high-producing dams. Special pedigree breeding work is also receiving careful attention and marked progress is being made.

The same maxim applies in all breeding work and is backed by figures. That is, if rapid progress is to be made in raising the standard of production, the breeder cannot afford to use sires that have not official qualifications in their ancestry to warrant or guarantee that they possess the heritable qualities that place them well above the average standard of inherited qualities possessed by the females on which they are used. Figures submitted previously in this article go to prove that when sires are used that do not possess these qualities, the per cent of inferior animals is increased. This is applicable to male or female;

Dominion Experimental Farm, Nappan, Nova Scotia.—Variety test plots of cereals at harvest time.

consequently, the standard of production is not increased, and cost of production remains so high that it is impossible to expect a reasonable return for labour and money invested. Maxims: "Breed from the best to the best"; "Feed the best to the best"—and your labour will be well rewarded.

Egg-Laying Contest.—The Nova Scotia Federal Egg Laying Contest was started at this farm in 1919. This is a very popular feature of the poultry work. It has been the means of stimulating a greater interest in the poultry industry. This is borne out by these facts: (1) The correspondence received at this farm enquiring for information on poultry house construction, breeding, feeding, and care and management has more than tripled since the contest started. (2) The increase in demand for bred-to-lay stock. (3) The average production from the contest for 1919-20 was 121·1 eggs per hen; in 1920-21 it was 127·7 eggs per hen, and in 1921-22 it was 138·3 eggs per hen—a gradual yet creditable increase in production. These results are indicative of progress and go to prove that the Egg Laying Contests have been a means of stimulating a greater interest in the poultry industry. That they will be of incalculable value to the industry is undoubted.

Dominion Experimental Farm, Nappan, N.S.—Variety test plots of roots.

Field Crops.—As it is important that every farmer should concern himself with the production of the soil, and as it is imperative at the present time that careful thought should be given to soil improvement and kinds of crops best suited to different sections of the country, an expansion of this work has resulted at Nappan. Data are being collected on suitable rotation of crops, cost of production, kinds of crops best suited to this district, cultural methods,

grain mixtures, fertilizer mixtures, and drainage effect. Last year, new work with marsh improvement was started, this being a very important phase in farming throughout this section, where thousands of acres of marsh-land have become non-productive or reached a state of production that is not profitable through lack of proper drainage or cultivation. Drainage is one of the biggest questions in marsh improvement, for once marshland becomes water-soaked, it is not long in becoming non-productive. In a year or two it is anticipated that sufficient figures will be available to prove that these marshes can be brought back to a profitable state of productivity.

Horticulture.—The horticultural division has for its work variety testing of vegetables, strawberries, bush fruits, apples and potatoes, investigating the best methods of cultivation for growing these crops, testing out spray mixtures and their effects on different crops, the more extensive work being carried on with apples, strawberries and potatoes. In apples, it has been demonstrated that there are certain commercial varieties that can be profitably grown in this district such as McIntosh Red, Grime's Golden, Golden Russett, Baxter, Fallowater, North-western Greening, Pewaukee, Yellow Transparent, Duchess, and Red Astrachan. It has also been demonstrated that Irish Cobbler, Carman No. 1 and Green Mountain potatoes are the leading varieties to meet the market demand, though there are some English varieties such as British Queen and Arran Chief that out-yield them. Strawberries have also proved to be a profitable crop for this section. The ornamentation of the home grounds has also received considerable attention, different varieties of parennials and annual flowers having been tested. Shrubs for lawns and hedges have also been grown and their possibilities well demonstrated for ornamental purposes.

THE DOMINION ILLUSTRATION STATIONS IN QUEBEC

By JOHN FIXTER, Chief Supervisor

FOR thirty-six years, the Experimental Farms Branch of the Dominion Department of Agriculture has been investigating problems relating to soils, their various characters and needs, fertilizers, their qualities, composition and best methods and rates of application, soil drainage, rotation of crops, cultural methods, and best varieties to grow under conditions varying as to soil, climate and type of farming pursued.

From this research and experiment, there has been gathered a vast accumulation of well-proven, practical results. It remained, then, to bring these results to the attention of the farmers of Canada through every possible channel, and of these there is none better than actual illustration carried out by practical, everyday farmers upon their own farms.

A system of Illustration Stations, then, was established in the different provinces, not with the view of conducting experiments thereon, but solely to illustrate and drive home the fact that increased profits were to be made from the application of already proven experimental results to commercial farming.

In 1916, Illustration Station work in the province of Quebec was begun, and at the present time, thirty-one stations are in operation, and three additional stations have been selected and will start operations in the spring of 1923. (These stations serve as organized centres where the results of the experiments are demonstrated in a practical way).

Dominion Illustration Station at Stanbridge East, Quebec.— General view.

Rotation of Crops

When a farm is selected, the first work undertaken is to divide the land into definite areas in preparation for a systematic rotation of crops. On all the Illustration Stations in Quebec, a four-year rotation is practised. The following plan illustrates this rotation:

FOUR-YEAR ROTATION

——	Field A	Field B	Field C	Field D
First year.....	Hoed crops.....	Grain and seeded clover 10 lbs., timothy 10 lbs. per acre.	Clover, 1st cut, hay; 2nd cut, seed.	Hay or pasture.
Second year.....	Grain and seeded clover 10 lbs., timothy 10 lbs. per acre.	Clover, 1st cut, hay; 2nd cut, seed.	Hay or pasture.....	Hoed crop.
Third year.....	Clover, 1st cut, hay; 2nd cut, seed.	Hay or pasture.....	Hoed crops.....	Grain and seeded clover, 10 lbs., timothy 10 lbs. per acre.
Fourth year.....	Hay or pasture.....	Hoed crops.....	Grain and seeded clover, 10 lbs., timothy 10 lbs. per acre.	Clover, 1st cut, hay; 2nd cut, seed.

A great deal of the success in growing crops economically depends on the thoroughness of the cultivation given and the methods employed when cleaning the land for the hoed crop. If this work is not efficiently done, weeds will seriously affect the grain crop in quality and quantity, and will also make it practically impossible to produce pure, clean, red clover seed. Hence in conjunction with these rotations, the practice of after-harvest cultivation is followed in preparing the land for the hoed crops.

After Harvest Cultivation

When preparing sod land for hoed crops, the system followed, and found successful on the Illustration Stations, is to plough shallow as soon as the hay is taken off, turning a flat, shallow furrow. The roller is next used to firm the sod in order to hasten its decomposition and to prevent the sod from being torn up with the later cultivation. Throughout the summer and until late fall, the land is kept frequently stirred with an oval-pointed cultivator, where possible, to keep down weed growth and to bring the couch grass roots, etc., to the surface. Prior to freezing up, the land is again ploughed in the same direction as before, and as deep as the nature of the soil will allow. Averaging the Stations in Quebec for 1921, it was found that it cost $3.91 per ton to produce ensilage corn on land that had been fall ploughed only, and $2.17 on after harvest cultivated land. There are also indirect benefits to succeeding crops, which are unaccounted for here.

Growing Red Clover Seed

When the Illustration Station started in the Aubrey district in 1916, it was found that the farmers were purchasing their red clover seed, which was mostly imported seed. A start in clover seed growing was made on the Station in 1917, and since that time, successful seed crops have been grown from the second crop of red clover, which had previously been pastured. The records kept by one of the farmers who grew clover seed and bought a huller, show that since that time he has threshed 31 tons of seed. The Provincial Government huller, from 1917 to 1919, threshed 17 tons, 414 pounds, and the Farmers' Club huller, since 1917, has threshed 63 tons, 1,835 pounds, making a total of 112 tons, 249 pounds. Valuing this at current prices, this one Illustration Station project has meant an additional revenue of $80,135.15 to the farmers of the Aubrey district. Red clover seed has also been grown with good success on the Illustration Stations at Stanbridge East, St. Julie, St. Clet, Lachute, St. Casimir,

Plessisville, Pierreville, Campbell's Bay, and as far east as New Carlisle on the Gaspe Peninsula.

Tile Drainage Demonstration

To reclaim to more profitable production those lands that are wet and cold, and also the heavy clays that are resistant to tillage through lack of drainage, an effort has been made to demonstrate the usefulness of underdrainage on certain Illustration Stations. When the station was started at Stanbridge East, seven years ago, two four-year rotations were laid out on adjoining portions of the farm. One rotation was partially tile drained, the other was left undrained, but was ploughed into narrow ridges and carefully surface drained.

Records as to yields and cost of production have been kept on both rotations, to determine the gain that would result from drainage. Five years' average results show that the tile drained land has given an increased yield over the undrained land of 2½ tons of corn per acre, 9·3 bushels of oats per acre, 1,440 pounds of clover hay per acre, and 900 pounds of timothy hay per acre.

Turnips and Mangels Introduced

There are many districts in Quebec where hay and grain growing are specialized in, with the result that the land is steadily becoming weedier and yields are falling off. In many of these districts, the belief is that root crops cannot be grown successfully under their soil and climatic conditions.

In connection with these two crops, the work of the Illustration Stations takes on two forms: first the extension of the root growing areas, and secondly the demonstrating of methods that will reduce hand labour, and thereby lower the cost of production of roots. With the idea of introducing and improving the cultural practices relative to these two crops, the growing of either one or both is being illustrated on all the stations in Quebec. The results of a survey made of twenty-four farms in the vicinity of the Illustration Station at St. Jules, Beauce county, will illustrate the increase that has been made in this respect since the establishment of the station at this place:

Showing condition of farm buildings when illustration work began.

Year	Number of farmers growing turnips	Tons produced
1920	2	10
1921	4	31
1922	24	344

Determining Cost of Production

Unless an accurate record is kept of all the items of expense that enter into the cost of producing crops, it is impossible to check up on costly crops

and defective methods. Too frequently the cost of growing farm crops is underestimated, because the farmer and members of his family do a great deal of the work themselves. On all the Illustration Stations careful records are kept of all items of expense pertaining to the cost of growing each crop on each station. These items include rent of land, use of machine, horse and manual labour, threshing, cost of seed, cost of manure and fertilizers. By so doing it is possible to check up defective methods, and to determine which are the most profitable crops to produce. As all the fields on these Illustration Stations are fronting on the main travelled highway, the method of growing and handling comes under the public eye. In this way passers by become informed as to the possibilities of growing such crops as corn, sunflowers, roots, clover seed, etc., and the proper methods of handling them.

Field Meetings

Not only is the work on the stations noted from the public highway. but practical discussions, in the form of field meetings, are held on these stations during the growing months. At these meetings, all the details relative to the different crops—the varieties of grain, the preparation of the soil, the rates of seeding, the methods of handling fertilizers—are discussed. In this way the results of the work done on the Experimental Farms themselves are brought to the attention of the farmers in the different districts, and methods proven sound, safe and profitable relieve those farmers of the anxiety, disappointment and loss which poor farming methods or haphazard individual experiments would otherwise bring.

On the same farm, three years later.

SALVING A TUBERCULOUS DAIRY HERD

Successful Operation of the "Bang System" at the Central Experimental Farm

ABOUT six years ago, the Central Experimental Farm at Ottawa introduced the Bang System in connection with its dairy herd, which was then undergoing the process of "accreditation." Under this "accredited" system, a herd is tested for tuberculosis every six months, the reacting animals being removed from the herd. When reactors cease to appear under the test, the herd is accredited by certificate as tuberculosis free. Under the Bang System such reactors as are considered sufficiently valuable are segregated and isolated from all contact with other animals, their progeny being added to the main herd. The length of time during which the reactors are retained depends on their age, period of gestation, producing ability, and the progress of the disease; but gradually they are eliminated, and in the course of time the Bang herd ceases to exist.

The object in establishing a Bang herd at the Central Experimental Farm was twofold: first, to preserve for breeding purposes a number of exceptionally valuable cows, and second, to demonstrate the value of the Bang System. The segregated animals were isolated in comfortable, well ventilated and properly appointed premises on an adjoining farm some two miles distant from the Central Farm. The cattle were in charge of a skilful herdsman, and were treated in a normal manner in all respects. The maximum number of animals in the Bang herd at any one time was 23 head, while the total number isolated during the whole period was 66 head, and included Holsteins, Ayrshires and Jerseys. All of the cows were of high individual merit and record. Some of them remained in the Bang herd throughout the whole period, others were retained for a short time only.

During the winter the segregated animals were kept inside, but in the summer they were allowed on pasture. The milk was thoroughly pasteurized and separated, the skimmilk being used for feeding hogs and the cream being made into butter. The cows were for the most part bred to reacting sires. When a reacting sire was not available they were bred to another on neutral ground. The calves were removed soon after birth and placed in isolated pens until tested before being allowed to mix with the calves from the healthy herd on the main farm. Of the sixty-six head isolated, 49 gave birth to 80 calves. Of this number 18 died previous to six months of age; 17 at the age of six months or over reacted to the tuberculin test, some of which infection undoubtedly occurred in the main herd, it not yet having been cleaned up; 45 remaining free from the disease. Of the latter, 19 have been sold and 26 retained in the breeding herd.

During the period under review, 51 Bang cows were slaughtered. The majority of these were removed to make room for other and more valuable reactors and comparatively few on account of clinical symptoms of advanced tuberculosis. In the latter class there were not more than six cases. On the other hand, there were a number of cows that had outlived their usefulness but were still in excellent condition, which, upon slaughter and examination, proved to be highly generalized and advanced cases. This goes to prove what has been repeatedly observed, namely, that a cow may be in an advanced

stage of tuberculosis and still not show any outward symptoms of the disease. Furthermore, the experience with this herd has shown that a cow may be in an advanced stage of tuberculosis and still produce milk quite heavily and profitably. Another outstanding observation as regards the health of the herd was that quite a large percentage of the cows when slaughtered showed only old calcified lesions, while a few showed two distinct sets of lesions, one old and calcified and the other recent and open. This would go to show that in many cases, nature, assisted by a rugged constitution in the animal, had isolated the infection and thus put the animal in the non-spreader class. The presence of a secondary set of open lesions in some animals points to reinfection through being stabled with spreader cases.

Some cows that were in the Bang herd for two, three, and even four years, when slaughtered, proved to be but slightly infected, indicating that an animal may be some time developing the disease even when amongst diseased animals and, when eventually infected, may show considerable resistance to the ravages of the disease. On the other hand, among cows in the main herd that reacted and were slaughtered immediately, numerous generalized open cases were found, which goes to show that infection may take place rapidly and run a rapid course. It may be inferred that the rapidity of infection depends on the virulence of the strain of bacteria introduced and on the power of resistance in the animal itself.

Milk and butter-fat records were kept of the Bang herd during the entire period. Eight of the cows qualified in the Record of Merit test and 13 in the test for the Record of Performance. Of the latter, eight records from mature cows averaged 461 pounds of butter fat, nearly all being made in less than 365 days. One Ayrshire cow, Marjorie 8th of Ottawa, during the four years that she was in quarantine, gave 32,987 pounds of milk containing 1,214.74 pounds of fat. This animal when slaughtered proved to be badly infected in the lungs and bronchials. These and other creditable records would indicate that tuberculosis, up to a certain stage, does not necessarily reduce the milk production of some cows; in fact, the production of the Bang herd varied but little from that of the main herd.

An accurate account was kept by the Experimental Farms Branch of the expense incurred in operating the Bang system from December 1, 1916, to November 1, 1921. The receipts for milk, calves and manure amounted to $22,108.06. The expenses, which included feed, bedding, rent of building and labour, amounted to $15,-930.63, leaving a profit of $6,177.43.

Conclusions

In the light of the experience of the Central Experimental Farm, it is concluded that the Bang system is both feasible and practicable where circumstances warrant its operation. According to the views of the Experimental Farm officials, these circumstances would be (1) The existence of a herd or herds of pure-bred cattle of sufficient size and high quality to make the isolation of reactors and the reclaiming of their progeny profitable; (2) A sufficient number of reactors of high quality within the herd to ensure returns on the overhead charges that must be met in maintaining a Bang herd, which overhead charges might be so great as to exceed the returns from only a few reactors.

In view of the rapid adoption of the Accredited Herd System, now taking place, and particularly since the reduction of the compensation on reacting animals, there are undoubtedly many herds that might adopt the

Bang system and at the same time fulfil the Accredited Herd conditions. In some cases, where the individual herds are not sufficiently large or the reactors within the herd not so numerous as to warrant the introduction of the Bang system, a group of breeders might unite in maintaining a joint herd under the Bang system.

A conclusion which should not escape attention is that if a Bang herd is to justify its existence at all, *it must be established simultaneously with the entry of a herd into the Accredited Herd System,* for the reason that it is at this time that the greatest number and often the highest quality reactors will be found. As each successive test proceeds, the number of reactors naturally decreases, so that, in the course of a few years at most, the herd should have a clean sheet and the Bang herd would be gradually eliminated. It is when the herd has this clean bill of health that the owner who has omitted to establish a Bang herd may wish that he had done so and thus have retained some of his favourite individuals and strains.

MOSQUITO CONTROL AT BANFF, ALBERTA

By ERIC HEARLE, Assistant Entomologist, Entomological Branch

IN the *Agricultural Gazette* for May-June, 1922, the writer contributed a brief statement on an aerial survey of mosquito breeding places, conducted in the Lower Fraser Valley of British Columbia, which survey was made in 1921. In the same year, in company with Mr. Arthur Gibson, Dominion Entomologist, a brief survey was made of mosquito infested areas in the Rocky Mountains National Park, adjacent to the town of Banff and the station of Lake Louise, Alberta.

It had been recognized for some time that relief from the mosquito trouble might be possible, and in the summer of 1916, the late Dr. Hewitt undertook a preliminary survey and drew up valuable recommendations. During the last three or four years a certain amount of control work has been conducted under Messrs. Sanson and Childe of the Dominion Parks Branch, and considerable success was met with in the reduction of the mosquitoes. In the spring of 1922, Mr. Arthur Gibson, the Dominion Entomologist, arranged for a detailed investigation into the pest and the writer was given charge of all the investigational and control work. Oiling operations were extended much further than previously and, as a result, the mosquito pest in the vicinity of Banff was reduced to a negligible quantity during the past season.

The 1922 investigations showed that of a mosquito fauna of some 18 species only three of these were important pests.

There were found to be two main problems—the snow pool problem in the early summer and the flood water problem dependent upon the river freshets. In the former, one species of mosquito only is important, namely, *Aedes cataphylla Dyar;* but in the latter, while *Aedes cataphylla Dyar* is the species of main importance, *Aedes intrudens Dyar* and *Aedes vexans Meigen* have also to be reckoned with. In May, the melting snows fill depressions with water and larvæ of *Aedes cataphylla* are to be found in these pools in great numbers. The majority of these emerge during the last week of May and constitute the snow pool pest.

The time of the river freshet varies. In 1922 it occurred in the first week of June. Mosquito larvæ were found in vast numbers in the flooded areas and most of those that escaped the application of oil completed development before the end of the month. Collections of larvæ made throughout the district showed that the low-lying area to the west and north of the town is mainly responsible for the pest. In some parts of this basin fairly extensive meadows occur, but dense willow growth clothes the remainder. The breeding areas appear to be of importance to a distance of about four miles west of the town.

Mosquito Breeding Area near Banff.—Flooding of such areas causes ideal conditions for mosquito development.

During the past season, oiling was mainly resorted to in dealing with the pest. Four men were employed throughout May and June to apply oil, and occasional extra help was provided as needed. Oiling occupied some 194 days labour and about 2,800 gallons of oil were applied. Watering cans and knapsack sprayers were utilized in spreading the oil. The whole breeding area was divided into three districts, one man being held responsible for the work in each. Large drums of oil were distributed by truck to various points in each district, and from these points the oil was transported in smaller containers to a number of stations in the breeding areas. A pack pony and a canvas boat were found useful in this connection. Oil was spread on all water where larvae were found, and whenever oiling was completed in any one section, patrols were made to ascertain if effective killing had been secured. Coal oil was used alone as, owing to the cold nights, it was thought inadvisable to use heavier oils.

A number of the breeding pools were undoubtedly missed owing to the difficult nature of the territory involved; and in some of the more

open stretches wind rendered the oil film partially ineffective. In spite of this, however, the results of oiling were very marked, and about 75 per cent control was realized. The town of Banff and the immediate vicinity were rendered comparatively free of mosquitoes.

After the necessity for oiling was over, the mosquito squad worked on permanent improvements. A number of ditches were dug to divert small streams feeding various swampy areas. In many parts of the district the willow growth was found to be so dense that penetration was extremely difficult and the work of oiling was greatly retarded. To mitigate this a large number of trails were cut through these areas and the majority were rendered easily accessible.

During the season of 1923, the Entomological Branch plans to continue investigations into the mosquito situation at Banff. Flight experiments will be conducted to ascertain the actual distance from which infestation is possible; and it is hoped to secure data regarding the possibility of introducing certain natural control elements such as the minnows, which would materially reduce the cost of oiling operations. Experiments have also been projected to test out the comparative values of oils, larvicides, etc., and their adaptability to the needs of the district.

Oiling from boat at edge of Vermilion Lakes.

MYCOLOGICAL PROBLEMS IN MANUFACTURE AND CONSTRUCTION

By H. T. GÜSSOW, Dominion Botanist

FROM time to time we are consulted in matters pertaining to mycology or fungi generally which do not strictly relate to these plants as causal agents of plant diseases. Yet in other respects they are of considerable interest and a resumé is herewith given recording some of the more interesting matters that have been brought to our attention. Fungi, especially the microscopic forms, play such an important role in the economy of nature that those forms appearing associated with industries of mankind are only very occasionally referred to.

Every housewife is familiar with the annoying and persistent spots that result from allowing fabrics of any kind to remain damp. Popularly such spots are referred to as mildew or mould spots. When they appear, whether in linen, cotten, silk, wool, or leather, they are most disfiguring and a source of much disappointment. These spots may vary considerably in size and colour. Sometimes they appear in large numbers not larger than a pinhead; sometimes they are of considerable size. From grayish, yellowish, greenish, they may also appear with brick red edges, or appear almost black. All these spots are very different from ordinary stains, or rust spots. They penetrate the tissue, and materials left too long in a damp condition may be hopelessly spoiled. On studying these spots in a mycological laboratory it is quickly recognized that they are caused by quite a number of minute fungi, but there cannot be any doubt that bacteria and yeasts also, are responsible for the production of such spots. The different colours are no doubt due to specific organisms. Among these may be mentioned the common green and blue moulds (*Penicillium*), several of the bread moulds (*Mucor*), and species of a fungus known as a most remarkable colour-producer, viz: *Fusarium*. We have also observed various coloured yeasts and cocci. Most of these fungi are starch-loving, and no doubt they feed upon the materials used for sizing. Glues, starch, and doubtless, substances used as mordants in coloured fabrics, supplied with the necessary moisture, will form quite congenial media for the growth of these organisms. The removal of these spots is very difficult; the sooner they are observed the more likely are the results to be successful. Sometimes ordinary laundering will reduce the intensity of the spots—heat from a sadiron and the promiscuous use of chemicals will often permanently fix the spots. Bleaching in the sun will often remove spots. Lemon juice, sour milk, lactic acid, Javelle water and permanganate of potash solutions will be often found useful. Any brown stain resulting from the permanganate may be removed by an application of peroxide of hydrogen. In coloured materials care must be taken to test the effect of any solution used on some piece of the same material less open to view.

Serious trouble is sometimes experienced in goods imported via ocean routes, dampness and wet affecting the tightly baled goods, whilst lack of ventilation, together with the practice of re-directing shipments before unpacking same, have led to many claims for damages. In such cases ordinary care in handling, and the provision of really dry situations in ship holds will do much towards enabling materials to escape serious injury.

The use of badly prepared paste often leads to very unsightly spots

on wallpapers. These are very difficult to remove, especially where there are damp walls. If kept absolutely dry, no spots are likely to result.

In examining recently some very special papers used in the manufacture of bank notes, our attention was called to the large number of mould spots appearing after the paper was kept moist for the purpose of printing engravings. The fungi responsible in this case were a *Penicillium* and *Stachybotrys*. Their appearance had to be prevented, since the paper was very valuable. It was found that passing the paper through formalin solution permitted the completion of the printing process without any further trouble. When such spots appear in finished copper or steel engravings that are of some age and value, our experience has been that it is best to make no attempt to remove them—generally the result from the attempt was worse than the original damage. These papers are generally laid papers and very spongy and do not stand even careful submerging in water.

Other cases that have come to our notice related to mould development in unmanufactured (raw) sheet rubber. Bearing in mind that rubber is the latex of certain plants, one can readily realize that this substance will form a medium for the growth of quite a number of fungi. The spots produced by the fungi were of quite different texture from the sound rubber. The affected portions had lost their elasticity and often were somewhat "doughy." Several bright yellow *Penicillium* species, one *Mucor*, and three *Fusarium* species were isolated. Probably infection had already taken place in the country of origin, and in the barrels or boxes in a ship's hold matters were not improved. Frequent sponging with formalin solution will prevent the appearance of such spots; and cool, well ventilated storage conditions should be the first safeguards provided. Sometimes the damage is very considerable, and rubber so infected cannot be used for the manufacture of high class articles, such as inner tubes, etc., where elasticity is the principal requirement. Leather goods also are often liable to become mouldy; but, in general, such a condition is due to neglect in keeping such goods in reasonable condition.

Our plates 1-4 show the result of the growth of a higher type of fungus, one of the most serious offenders in wooden buildings, barracks, warehouses, etc., etc., including the very diverse materials that may be contained or stored in such places. The fungus in question is popularly known as "dry rot fungus," a term which in its flexible use, may include a number of forms or groups of forms. In this particular case, the causal agent proved to be the true dry rot fungus, *Merulius lacrymans*. Among several cases brought to our attention one within the last year deserves special mention. Samples of wood forming a wooden structure, together with some of the materials stored therein, were received and carefully examined. There was present abundant fruiting material from which the fungus could be identified.

The fruiting bodies of this fungus vary considerably in size and shape, depending largely upon the undisturbed and favourable conditions under which they are produced. In the early stages one may discover a white, cottony, more or less dense growth of fungus spawn spreading over the surface of any kind of structural wood. Thus flooring, window sills, joists, beams, posts, etc., may exhibit these symptoms. If left undisturbed, these white cottony patches increase in size and may become confluent. At a later stage the patches assume in

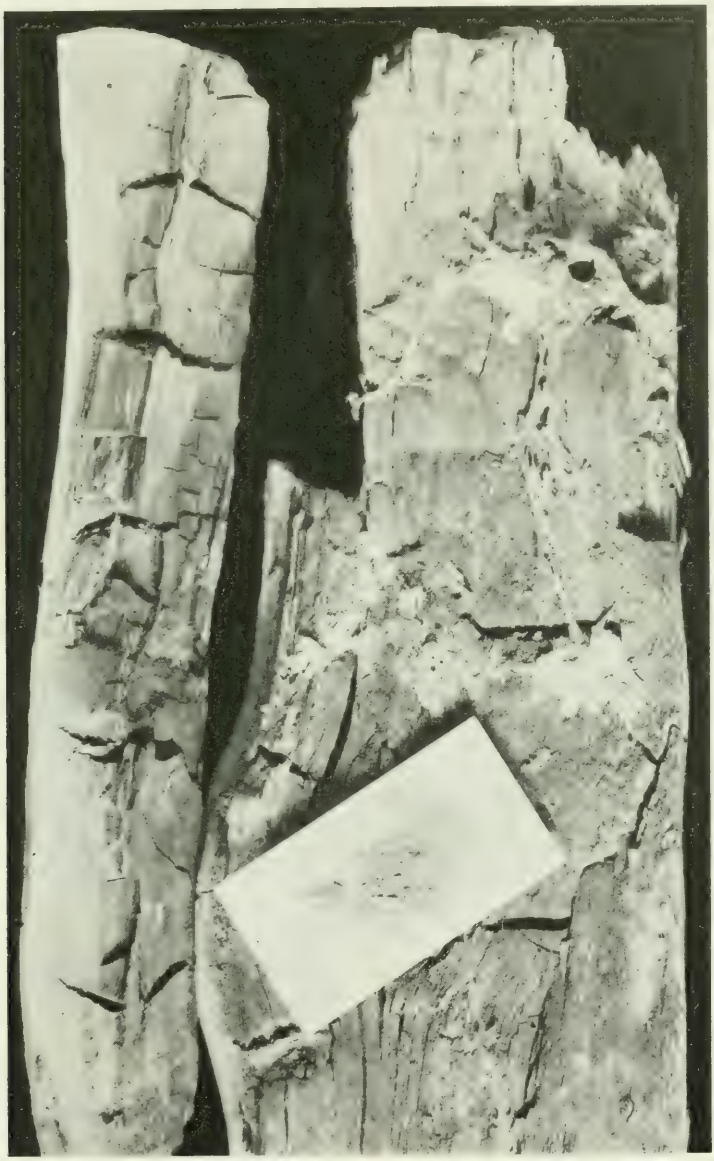


Plate. 1. Portion of 2" plank showing typical "dry rot" produced by *Merulius lacrymans*, the dry rot fungus. The characteristic mycelial strands of the fungus are still visible. When rubbing decayed wood between finger and thumb a fine powder is the result—as shown on the small piece of cardboard.
Photo H. T. Güssow.

their centres, yellow, orange to reddish brown tints, becoming darker and darker with age, until sometimes the centre may be a deep chestnut brown. The edges, however, always remain cottony white, as long as the fungus is alive. These colour changes indicate the progressive stages of maturity. While they are proceeding, organization of the fruiting layer takes place, which first manifests itself by curious raised, wormlike folds, commencing in the centre and becoming more and more prominent as the intensity of colour increases. Eventually there is formed over these folds a gelatinous, smooth covering, in which the reproductive organs develop (hymenium). One very prominent feature, more particularly under moist atmospheric conditions, is the development of beads or drops of water on the surface of the active growth zones of the fungus patches. Hence the specific name lacrymans from the Latin lacrima or lacruma, a tear, in its verbal participial form, "weeping." The fruiting layer (hymenium) consists, as in other fungi, of groups of a large number of club-shaped organs which carry four golden yellow spores. These spores are the reproductive organs, and being exceedingly minute, may be dislodged from their supports by very light air currents. In this manner they fill the air of infected buildings, settling slowly and starting new infections as they fall upon suitable materials. The principal condition for life of these fungi is moisture. In absolutely dry buildings dry rot fungi cannot exist. The name dry rot fungus is not very fortunate, since moisture is essential to its growth; and only in the peculiar dry powdery nature of the destroyed wood has the epithet its justification.

The effect of the growth of the fungus on wood is very destructive. It may be said that apparently no kind of wood is absolutely resistant. All our commonly used kinds of lumber for building purposes are easily affected—though apparently, cedar is able to resist longest. Long before external signs of the fungus becomes noticeable, affected wood appears abundantly permeated by the spawn or hyphæ of the fungus. These hyphæ possess the property of forming long dense strands which act as conductors of water. It is remarkable to observe how the fungus may conduct water from a considerable distance, and thus furnish one of the most essential elements for its growth. The infected wood assumes a peculiar golden brown colour, which, no doubt, is the result of a chemical metabolism due to the fungus. The wood loses enormously in substance, the shrinkage amounting to some 60 per cent of its original volume. It becomes extraordinarily light in weight when the fungus has completed its destructive work. This loss of substance is accompanied by the very characteristic production of deep and severe cracks or tearings—see fig. 1. When in this condition, the affected portions of wood absorb and retain water like a sponge, and, for a time no doubt, act as reservoir to supply the requirements of the growing fungus. When dry, the wood may be so brittle as to be readily reduced to a fine dust or powder by rubbing portions between the finger and thumb.

Naturally so severe an attack on the rigidity of wood, reduces its supporting value and frequently floors, ceilings, partitions, etc., will suddenly collapse. Indeed the destructive work of the fungus, unless its presence is known in time, may render occupation of infected buildings postively dangerous to their inhabitants. There is one feature worthy of notice. Buildings affected

with dry rot generally indicate its presence by a pronounced fungous or musty odour, which, indeed, is often the cause of complaint and which, on investigation, will reveal the fungus in many cases.

The fungus may spread with considerable rapidity, and, before its ravages have become known, very considerable damage may result to any or all of the contents of such attacked structures. Wall papers, and from these, pictures on the walls, overmantels, carpets, books, and even furniture situated close to an infected wall may become infected.

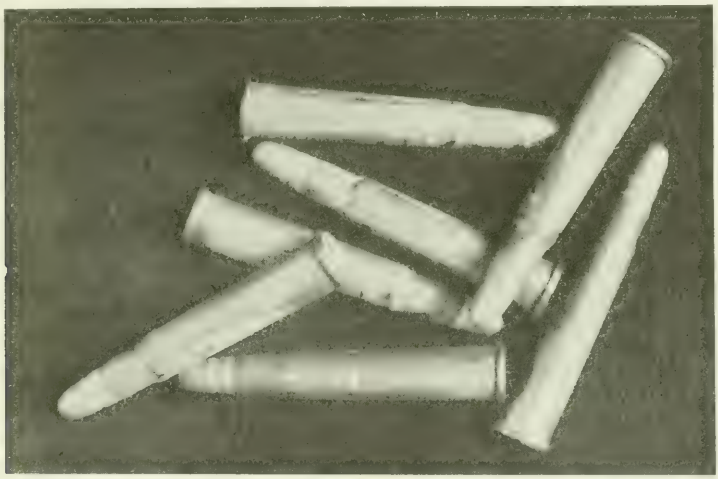


Plate 2. Small arms ammunition rendered unserviceable through the action of dry rot fungus. The brass casings are severely corroded, mycelial remnants still adhering thereto. Photo H. T. Güssow,

The fungus material will quickly permeate the wood of boxes, cover and involve the entire contents of the same, appear on the outside, produce its spores, and, if undisturbed, quickly infest an entire room set aside for storage purposes. We are able to show some of the effects of the fungus on materials not generally regarded as suitable media. In the case of fig. 2 representing a quantity of small arms ammunition taken from magazine shelters, it will be noticed that the fungus caused a corrosion of the cartridge casings to such an extent as to render the use of the ammunition decidedly unsafe. No doubt the physiological action of the fungus, or else the oxidizing effect of the moisture present, was responsible for the damage to these cartridge cases. That the physiological action of the fungus is most pronounced is, of course, seen in the wood, but our fig. 3 forms a most interesting example of such action. The garment figured was taken from certain stores, and was originally of a bright blue colour. These garments were piled on wooden shelves infected by the dry rot fungus, which eventually spread into the garments and produced a most brilliant display of colours, such as cannot be reproduced to any striking extent by an ordinary photograph. The colours ranged from a crimson to a bright pink and from yellow to all tints of green, leaving towards the outer edges fan shaped white masses of the fungus hyphæ. The garments were completely spoiled by their display of colour, as well as by having become thoroughly decayed.

In conclusion, a few words may be said as to the origin of infections, from which may be gathered instructive hints as to the prevention of the same.

As has been said before, dry rot will never appear in buildings that are quite dry. Lack of ventilation, the use of wet lumber, the use of damp saw dust between partitions, indeed anything introduced into construction not thoroughly dry, are the principal causes of an outbreak.

Once a building is severely affected, no repairs will for any length of time save the structure. The spores of the fungus previously present will start into active life, unless adequate provision is made as regards ventilation and artificial heating. If observed in time before any fructification has occurred, it might be possible to remove infected wood and replace same by sound. But the difficulty in saving a building once infected is very great. When repairs have been resorted to, it is obvious that all infected material must be removed and it would seem advisable to thoroughly disinfect the entire room, or structure, as the case may be, by the use of formalin washes or sprays, followed by a very thorough and prolonged period of ventilation or artificial heating.

If the damage is severe, the most economical way is to destroy the structure by fire, where possible, and not to erect another on the same situation, unless care is taken that all infected material is disposed of. We have often observed the use of very wet rough lumber for flooring over joists before the top finishing layer was placed in position. With any fungus spores present, and with the prospect of a damp spring and lack of fires, such a practice is to be condemned, and often enough serious damages from dry rot may be traced to such careless use of wet lumber. The use of old lumber previously used in other structures may be tempting because of low initial cost, but should be avoided unless its former use is known. In wood yards considerable damage has been observed to new lumber piled on decaying, dry-rotted supports. Naturally, slightly infected lumber will es-

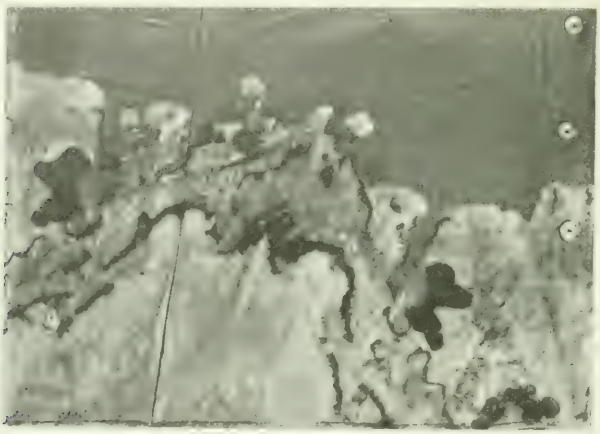


Plate 3. Effect of the vegetative mycelium of *Merulius lacrymans* on a garment. Originally bright blue in colour, the action of the fungus produced a remarkable colour effect varying from purple to pink, and yellow to green. One of the buttons made of vegetable ivory palm seed also showed signs of deep corrosion.
Photo H. T. Güssow.

cape the notice of the purchaser, and thus introduce the germ of a very costly and destructive agent.

One reason why the losses from dry rot in Canada are not so severe as in European countries is that the climatic conditions are less favourable to its development, but more particularly, we owe our relative immunity to the thorough drying our houses receive during a long winter's heating.

We are aware of the recommendations made relative to the use of creosoted lumber, which, no doubt, is most suitable for some purposes, but quite out of place in dwelling houses, hospitals, cheese factories, or breweries, where the odour will quickly become offensive and objectionable to the inhabitants, or injurious to manufactured substances likely to absorb the odours of creosote.

Besides *Merulius lacrymans*, one of the most destructive of dry rot fungi, there may be mentioned *Poria vaporaria* (Pers.) Fries, which may be referred to as pore-bearing dry rot fungus, since the very prominent pores which the fruiting layer forms, are a diagnostic feature. This fungus is nearly as destructive to wooden buildings as *Merulius*, and, since it is not uncommonly found on living trees in the woods, great care is necessary in examining the lumber used for building. The diseased wood becomes deeper in colour than that attacked by *Merulius*, and often assumes a red brown tint. It also is equally brittle. The fruiting bodies of *Poria* (see fig. 4) consist of a very thin layer of fungous material, in which the numerous irregular and very shallow pores are formed. Buildings attacked by this fungus may with care be repaired, and, if the wood is kept very dry, and painted with good oil paints, one may avert serious damage.

The Division will always appreciate having their attention directed toward any interferences of a like nature with any phase of manufacture or industry. The results from investigation into these matters will readily be placed at the disposal of inquirers, besides assisting us in accumulating valuable knowledge and materials relating to destruction brought about by fungi.

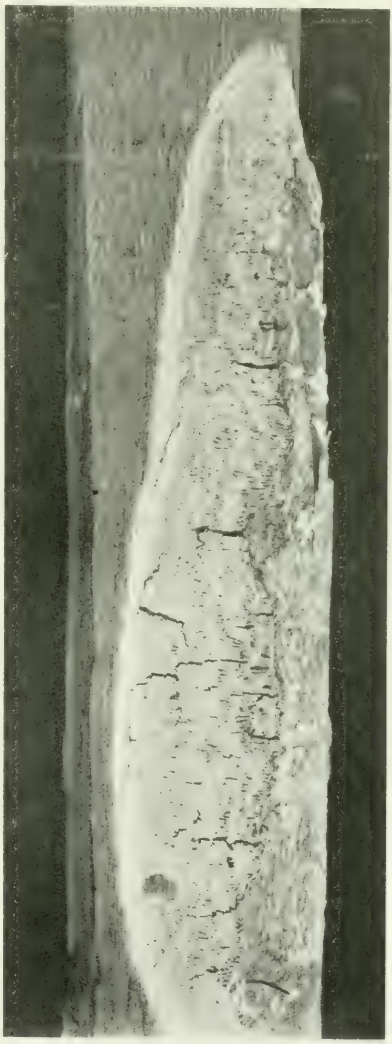


Plate 4. Fruiting layer of another type of dry rot caused by *Poria vaporaria*.
Photo H. T. Güssow.

CANADIAN GOVERNMENT STANDARDS FOR CANNED FRUITS AND VEGETABLES

By C. S. McGILLIVRAY, Chief Canning Inspector

TWO enactments are in force in the Dominion of Canada relating to canned and evaporated fruits and vegetables. They are The Food and Drugs Act and The Meat and Canned Foods Act. They are administered respectively by the Department of Health and the Department of Agriculture.

The Food and Drugs Act deals with the purity, wholesomeness and weight of all food products, and is effective everywhere in Canada.

The Meat and Canned Foods Act deals with the sanitary conditions of the plant in which the food is manufactured, the soundness of the raw material from which it is prepared, and requires that the container bear upon its label a true and correct description of the product.

This Act and the Regulations made thereunder applies in all plants doing an export or interprovincial trade where fruits and vegetables and fruit and vegetable products are canned, evaporated, dried or otherwise prepared for food, or where milk is canned, evaporated, dried or otherwise preserved. It also applies to places where such products are stored for interprovincial or for export trade.

Sanitation

An establishment manufacturing either of the aforementioned products for export or for interprovincial trade must first obtain a permit to operate from the Minister of Agriculture.

Before granting such permit the Minister must be satisfied that the premises in which the manufacturing operations are to be conducted are in all respects sanitary as to construction, equipment and appliances. The number of the permit when granted must appear on all boxes, cases, etc., used at the establishment. All employees handling food products in an authorized establishment must be free from tuberculosis or other communicable disease and must observe such sanitary regulations as the Department may require.

To see that these and other requirements are met, such establishments are inspected from time to time by the Department's inspectors.

The Act requires that all fruit, vegetables, milk, or other articles intended for use in an authorized establishment shall be sound, wholesome and in every way fit for food. Should any article of food be found, either in the course of preparation or after it has been prepared, to be decomposed, diseased, or otherwise unfit for food, it shall be confiscated by the inspector and destroyed under his supervision.

Description of the Product

The containers in which fruits, vegetables, milk or other articles prepared for food in any authorized establishment are placed shall be marked, unless otherwise ordered by the Governor in Council, (1) With the name and address of the packer, or, in the case of a firm or corporation, with the firm or corporate name and address of the packer, or of the first dealer obtaining it direct from the packer who sells or offers the same for sale. (Such dealer shall, upon the request of an inspector appointed under the Act, disclose the name of the packer of such article); (2) With a true and correct description of the contents of the container. This description is defined by regulation and is regarded as the standard of quality.

Standards of Quality

Four standards of quality have been legalized and clearly defined, namely, "Fancy Quality," "Choice Quality," "Standard Quality," and "Second Quality."

In addition to general standards for vegetables, specific grades have been established for canned peas. These are as follows: Size No. 1, Size No. 2, Size No. 3, and Size No. 4. The size is determined by the opening in the sieve through which the green peas will pass.

Canned fruits are graded for quality and syrup. In grading for syrup the terms of "Heavy Syrup," "Light Syrup," and "Without Sugar" are employed. The degree of syrup which constitutes these grades is defined. If the packer so desires, he may substitute for the words "Heavy Syrup," "Light Syrup," and "Without Sugar" the words "Packed in Syrup.....% Sugar," (stating the percentage of sugar in the syrup).

The terms denoting quality and grade must appear upon the main portion of the label in plain type of a size not less than $\frac{3}{8}$ of an inch in height. Thus, in the case of peas, the label must indicate the quality and size of the peas contained in the can. In the case of fruit, it must indicate the quality of the article as well as the consistency of the syrup so far as sugar content is concerned.

The declaration of net weight on certain sizes of containers is not required, as these sizes have been standardized. These sizes are known as Size 1's $1\frac{1}{2}$'s, 2's, $2\frac{1}{2}$'s, 3's and 10's. The minimum net weight of both liquid and solids as packed is defined for each of these sizes. Sizes not standardized must show on the label the net weight and the drained weight.

The administration of the regulations as to Standards is directed from Ottawa through a staff of trained inspectors. The goods are examined at the cannery and check samples are sent in for confirmation. If the goods are found to be incorrectly labelled, they are held for regrading or re-labelling. If goods found in a wholesale or retail establishment are not truly labelled as to grade, they are held until properly graded. The packer is always given every opportunity to show that his grading is correct, but if it is found to be incorrect, he must relabel the goods in such a way as to indicate the correct grade.

Export Shipments

The Act stipulates that no shipment of canned or evaporated fruits or vegetables or fruit or vegetable products may be made out of Canada without an export certificate first being obtained. This certificate is issued upon the written declaration of the shipper that the goods are marked as regards grade and quality in conformity with the Act. At the time of issuing such certificate, check samples are taken for examination and grading, and a report on the grading is sent to the shipper.

Import Regulations

No shipment of canned or evaporated fruits or vegetables is allowed to enter Canada unless it is accompanied by a certificate declaring that the product complies with the Canadian requirements. If a shipment arrives without this declaration, it is held at the Customs till arrival of proper documents. As soon as practicable after arrival, the goods are examined for marking and a check sample is taken for grading. If the goods are improperly marked they are held for proper marking; if improperly graded, they are held for proper marking for grade; otherwise they are returned to the country of origin.

THE SUSCEPTIBILITY OF GRAPE LEAF HOPPER EGGS TO NICOTINE

By W. A. ROSS and W. ROBINSON, Dominion Entomological Laboratory, Vineland Station, Ont.

LAST year two Concord graperies at Vineland, Ontario, badly infested with leaf hoppers *Erythroneura comes*, were thoroughly sprayed with nicotine sulphate 1-1600, in combination with Bordeaux mixture in one case, and with lime in the other, on July 3 and 4. At that time the majority of the nymphs were in the first and second instars, and the most advanced nymphs were on the point of changing from the fourth to the fifth instar. The spray destroyed practically all the immature hoppers, and much to our surprise, it also apparently destroyed most of the eggs, because, although eggs continued to hatch out in large numbers on adjoining vines, only an insignificant number hatched in the two early sprayed graperies. In order to secure confirmatory data regarding the ovicidal value of nicotine sulphate, we sprayed Concord leaves on July 8 with nicotine sulphate (1) 1-1600, (2) 1-1200, (3) 1-800, and marked some other leaves as "checks" In each experiment lime was added to the nicotine sulphate. On the leaves sprayed with 1-1600, no eggs hatched for 11 days, and after that only 4·4 eggs per leaf hatched. On the leaves sprayed with 1-1200 and 1-800, 3·2 and 1·8 eggs per leaf hatched respectively, but no nymphs appeared until 12 days after the application. On the "check" leaves 88·2 eggs per leaf hatched. The evidence, derived from these tests and from the two early sprayed graperies that nicotine sulphate destroys the eggs, appeared to us to be pretty conclusive; however, with a view of securing more precise information, series of spraying and dusting tests were conducted in the laboratory this past winter with definite numbers of eggs and with eggs of known age.

On account of the fact that *Erythroneura comes ziczac* was present in large numbers in the immediate vicinity of the laboratory, this variety was used in all the experiments. The hoppers were placed on one-year-old Clinton vines, and were confined by means of celluloid cages. As the Clinton variety has little pubescence on the underside of the leaves, no difficulty was experienced in locating and counting the eggs. The sprays were applied with a hand sprayer, and the nicotine dust with a hand blower. The results obtained from the tests are presented herewith in tabular form:—

NICOTINE SULPHATE 1-1600, HYDRATED LIME 5 LBS.–40 GALS.

No. of Experiment	No. of Eggs	Age of Eggs when Treated	Per cent Killed in Egg Stage	Per cent Nymphs which Died While Hatching*	Per cent Total Mortality
		Days			
2	511	1– 2	29·7	48·9	78·6
3	318	4	61·9	36·4	98·3
9	180	9–10	68·5	1·5	100
7	158	18–19	84·4	15·6	100
	208·2				

NICOTINE SULPHATE 1–1200, HYDRATED LIME 5 LBS.–40 GALS.

		Days			
6	568	1– 2	47·2	52·8	100
5	513	9–10	57·3	42·7	100
2	538	18–19	67·6	32·4	100
13	1619				

NICOTINE SULPHATE 1–800, HYDRATED LIME 5 LBS.–40 GALS.

		Days			
2	477	1– 2	63·5	36·5	100
3	519	9–10	71·8	28·2	100
2	491	18–19	78·4	21·6	100
7	1487				

†NICOTINE DUST—2.2% NICOTINE

		Days			
3	482	1– 2	8·8	20·1	28·9
3	508	8– 9	20·2	33·0	53·2
4	528	18–19	26·9	46·7	73·6
10	1518				

CHECKS

8	602	.....	5·7	6·3	12·0

*Nymphs succumbed in process of hatching. None of them actually emerged from the eggs.
†Niagara D.-11.

Heretofore we have recommended that the leaf hopper spray should not be applied until practically all the eggs have hatched, but now we know that this is unnecessarily late, and that it permits too many of the nymphs to transform to the adult stage. The above experiments have demonstrated clearly that nicotine sulphate 1-1200, in combination with lime, will destroy the eggs in all stages of development, and that this strength of nicotine is 100 per cent effective. It therefore follows that spraying should commence about the time the overwintering adults cease egg laying. With our present knowledge, we are of the opinion that the hopper spray should not be applied later than when the most advanced nymphs have just changed to the fifth instar. In cases where it takes a week or longer to spray the vines, spraying operations might well be started when the earliest nymphs are in the fourth instar. Thorough spraying at the time we now advocate should practically eliminate the second brood.

PART II

Provincial Departments of Agriculture

LEGUME PRODUCTION IN MANITOBA

By F. J. HARRISON, Professor of Field Husbandry, Manitoba Agricultural College

THE prosperity of the province of Manitoba depends primarily upon the economical production of grain crops. It has been estimated that about 65 per cent of the annual wealth of the province is derived from the sale of wheat, oats, barley, etc. The chief type of farming, therefore, is straight grain growing, the most common rotation in use being: first year, summerfallow; second year, grain; third year, grain; fourth year, grain.

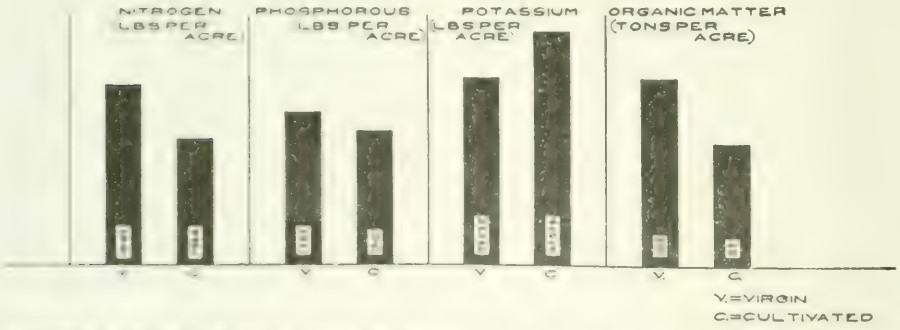
The result of this system of farming is that the farms are becoming infested with weeds, insects and plant diseases. In addition the soil has become less fertile because of loss of organic matter and nitrogen.

The above factors have been responsible for a decrease in yields and also grades. If grain productions is to be kept profitable the yield and quality must be maintained or increased. The only method by which this can be done is the introduction of forage crops into the rotation. Care must be exercised in the selection of these crops in order that they may not only improve the cropping conditions but can be easily marketed. Since they must be marketed through the live stock, only those that can be fed profitably should be grown. One of the most valuable classes of crops from the standpoint of soil improvement and the same time production of good feed is the perennial and biennial legumes.

In this province in the past legumes have occupied less than two per cent of the cultivated land; in the

ORGANIC MATTER AND PLANT FOOD ELEMENTS IN ACRE SURFACE SEVEN INCHES OF SOIL

MANITOBA



Difference in plant food between cultivated and adjoining uncultivated land. Mixed grasses and clover in the meadow will contain less of nitrogen and organic matter.

future they will have to occupy up to 20 per cent, if the percentage of nitrogen and organic matter is to be maintained.

Legumes Adapted to Manitoba

There are five perennial and biennial legumes that can be grown in Manitoba, i.e., Alfalfa, Sweet Clover, Red Clover, Alsike Clover and White Dutch Clover.

These crops not only serve to balance the ration for the farm live stock but also provide a means whereby nitrogen can be secured cheaply from the soil air. Alfalfa and sweet clover have deep rooting systems and may thus take the place of a sub-soiler in opening up the lower soil layers. It may be observed as well that such crops leave considerable organic residue in the soil. The latter material is important in that it increases the moisture holding capacity of the soil and in the process of decomposition assists in liberating plant food for the succeeding crop.

With the introduction of these crops, better systems of crop rotations can be organized and the farm income made more regular; moreover, the production of these crops is directly related to a better seasonal distribution of farm labour.

Alfalfa

Alfalfa makes decidedly the best hay and is the legume that will be grown wherever soil and climatic conditions will permit. This will be in the Red River valley, in the Northern Drift area, in the Riding Mountain Wash area and in the Swan River valley, and it is quite possible that after the farmers thoroughly learn the method of production, it will be grown in other parts of the province. There are three essentials in the production of alfalfa:

1st—The selection of northern grown seed of the Grimm variety;
2nd—A fine firm seed bed;
3rd—Inoculation.

Sweet Clover

Sweet clover will thrive in the drier sections and on lighter soils than the other legumes. It does not make as good a quality of hay as the other legumes but it can be used to better advantage for pasture in that there is less danger from loss from bloating of stock.

There are three types of this crop that can be grown in the province, i.e., the biennial white blossom, biennial yellow blossom and annual white blossom. For pasture purposes the rank growing white blossom gives best results; for hay production the biennial yellow blossom produces a finer quality. The annual white blossom will be used only where provision has not been made the previous year as it requires extra ploughing and soil preparation, since the biennial crops can be sown with a nurse crop the year previous.

Red Clover

Red clover is best adapted to a moist climate and for this reason is not proving an unqualified success in Manitoba. The area where it can be grown successfully is naturally restricted. It thrives around Whitemouth in the northeastern zone. It may also be grown with a limited amount of success in the Inter-lake and the Swan River sections. It is possible, however, that with the production of hardier strains, such as the variety originated by the Field Husbandry Department of the Manitoba Agriculltural College, the area may be extended.

Alsike Clover

Alsike clover is indigenous to a cool wet climate, and therefore, cannot be grown in the south and west

part of the province. It will be useful as an ingredient in grass mixtures, however, in the eastern and northwestern parts, particularly in the areas where red clover has been recommended.

White Dutch Clover

White dutch clover is very hardy but the plant is so small that it will never become an economic farm crop. It may be used in pasture mixtures; its main use, however, will be in lawn making.

Mixtures

For many years the main use of legumes except when grown for seed will be in mixtures along with grasses. The mixture will depend upon the crop which can be grown in the district and the purpose for which it is intended, i.e., hay or pasture. In general, however, the following mixtures will be found to give good results:—

In the alfalfa districts.—alfalfa and meadows fescue;

In the sweet clover districts.—sweet clover and brome;

In the red clover and alsike districts.—these clovers and meadow fescue and timothy.

Summary

(1) If grain production is to be continued profitably, legumes will have to be grown to maintain the fertility of the soil.

(2) Five legumes, alfalfa, sweet clover, red clover, alsike, and white dutch clover can be grown.

(3) There are three essentials in the production of all legumes:—

(*a*) Northern grown seed of hardy strains;

(*b*) Well prepared seed beds;

(*c*) Inoculation.

(4) Where alfalfa can be grown, it is the one that is recommended. Where it cannot be grown sweet clover may be substituted. The other three legumes will be grown in limited areas only.

(5) For some time, best results for hay and pasture will be secured by sowing these legumes in mixtures with grasses.

FIELD CROP IMPROVEMENT IN SASKATCHEWAN

I. THE WORK OF THE FIELD CROPS BRANCH OF THE PROVINCIAL DEPARTMENT OF AGRICULTURE

By M. P. TULLIS, Field Crops Commissioner

IMPROVEMENT of field crops as it applies to Saskatchewan, and for that matter generally, is carried out, keeping in mind both producer and consumer. A great deal of thought is now being concentrated on the marketing of wheat for the producer as putting the product in the hands of the consumer with the least waste in transit and at the most satisfactory price obtainable.

If all land in our province would grow 25 to 30 bushels per acre every year, the present market might be satisfactory. Unfortunately risks, including drought, hail, frost, rust, variations in the quality of the soil and variations in the efficiency of farm managers all combine to lower the crop average, reduce profit and so increase the risk of wheat growing. Marquis wheat (introduced by Dr. Saunders of the Central Experimental Farm, Ottawa) being earlier ripening than Red Fife, lessened the danger from rust and frost and spread

over the province in five or six years to the almost entire elimination of all other varieties. But rust and frost still cause loss occasionally, and there is room for other introductions, earlier ripening and more resistant to rust. Dr. W. P. Thompson of the University of Saskatchewan has been crossing a large number of wheats to get rust resistance, but difficulties arise in holding other desirable factors with the resistant types. There never was a more progressive age than at present, and agriculture has benefited from many of the recent scientific discoveries. Great strides have already been made in the breeding and selecting of more profitable varieties of cereals, grasses and vegetables, and valuable strains and varieties are being introduced from time to time.

Improving our field crops not only includes the introduction of more profitable varieties by breeding or selecting (Marquis wheat being an outstanding example), but also the choice of the kind of crop to be grown and the raising and maintaining of the quality and productiveness of the crops being used.

Dr. Angus MacKay of Indian Head found years ago that a limiting factor of production in parts of western Canada is the amount of rainfall. Experiments proved that the summer-fallow is a good reservoir for moisture and a link in the growing of grains. Like Marquis wheat, the introduction of the fallow has meant an increase of millions of bushels in the last decade. Unfortunately, the introduction of the summer-fallow into our system has developed a weakness. Soil drifting has entered the scene. This follows the depletion of soil fibre. When the soil surface is dry and fine, the high winds, so frequent on our prairies, cause clay and sand alike to drift about. Luckily, this is true only of some of our land as yet. It has been found that winter rye planted in the fall, and establishing a good root system before winter, is able to get away to an early and vigorous start in the spring, long before other crops show through the ground. As a temporary expedient this soil cover relieves drifting, but it does not return the fibre needed to permanently solve the problem. Professor Manley Champlin of the College of Agriculture, University of Saskatchewan, a couple of years ago pointed out the advantage of fallow substitutes or inter-tilled crops as a temporary expediency against drifting and an added source of revenue to the farmer. Corn, sunflowers, oats, barley and even wheat in rows are now being grown in a small way on many farms. Authorities are agreed that corn does not appreciably decrease the yield of wheat the following year. It is too soon to tell just what some of the other crops such as sunflowers will do in this regard, although under some conditions in some years there is no question that sunflowers will reduce the next year's yield as compared with either corn or bare fallow.

Important changes in our agricultural programme in recent years include the introduction in some districts of the province on a fairly large scale of corn, sweet clover and grasses. The first mentioned has a valuable place in our agriculture for its own value as a fodder for stock, and secondarily to prevent drifting. The others are of value as fodder, but not more for this than as a restorative of fibre and plant food to the soil as a permanent means of preventing drifting and making it more productive. While it is expedient in some localities to introduce these crops for the sake of the soil, apart from this feature altogether, the farmer realizes that straight grain growing is a great hazard. Some form of insurance must step in to permit a safer system. Fodder crops go with live stock and dairying and mean diversification of farming. With

these the farmer finds that should one source of revenue fail, another can in some measure, at least, fill the breach. *The cream-can*, the *quarter-of-beef*, the *five-cent-egg-of-January*, the *cellar-of-roots-and-vegetables*, the *stacks-of-clover-and-brome*, are all beginning to arouse widespread attention. They are by no means replacing the waving field of golden grain that the prairies are so proud of, but they will soon generally be an important supplement.

Nor will any variety of crops, or even any strain of a variety, do for our purposes. Care is being exercised that the most profitable strain of the most suitable variety is found. The Canadian Seed Growers' Association is a Dominion-wide organization having in view the raising of the standard of acceptable varieties of crops. In Saskatchewan the Field Crops Branch of the Department of Agriculture has carried out the field and bin inspection work for a number of years. Inspectors have the opportunity of discussing selection and improvement work with each pure seed grower. Fields are scored for purity and quality, and the growers can observe from these his progress as the years go by.

A catalogue of seed for sale by Saskatchewan farmers, including registered grain chiefly, was issued both last year and this by the Department of Agriculture. Many copies were distributed over the prairies of Canada and the United States. Due to the record of our grain at International shows, there is a strong call from the Dakotas for our seed. This outlet should increase as time goes on, as county agents there are spreading broadcast the need of replacing their seed grain by northern-grown seed, particularly of wheat and oats, on account of deterioration due to diseases prevalent there.

The Field Crops Branch has had charge of the collecting and displaying of the best of our grain and sheaf exhibits at the various International Agricultural Exhibitions, and it is believed that the interest taken in these exhibitions by the grain growers of the province has been of great value, not only to the farmers of Saskatchewan but to the farmers of the West generally. During the past eleven years the championship for wheat has been won nine times by Saskatchewan farmers. Another year the province had second place. In addition to the championships, eighty-four sweepstakes or first prizes were won for exhibits of grains, grasses and vegetables. It has been found that in very many cases there has been a marked improvement in the quality of the grain produced over large districts in the province due to the fact that seed grain was purchased from farmers who had demonstrated the superior quality of their strains at these exhibitions. It is remarkable that the prize winning exhibits have come from various sections of the province from the extreme south to points two hundred and fifty miles north of the international boundary line.

Part of the work of the Field Crops Branch is to maintain the purity of our grains by encouraging in every possible way the destruction of noxious weeds. The noxious weed situation on the prairies is not satisfactory. This is a most difficult problem in any of the great grain growing provinces or states. The active co-operation of the municipal authorities, the Department of Agriculture and the farmers generally is necessary to control the noxious weeds which are a serious handicap to good agriculture.

With field crop improvement, as with any other improvement on the farm, the value of the work accomplished depends upon the farmer himself. There is exceedingly valuable work being done in plant breeding

and selection at our experimental farms and agricultural colleges, but the farmer must take advantage of the experiments carried on for his benefit. In our own province the high standard maintained for such a large proportion of our crop, and the prompt advantage taken of new and superior strains introduced, is sufficient evidence that the western farmer is alive to his own interests and is ready at any time to try any new variety that experts have demonstrated to be of value. The very large increase in the winter rye acreage, Saskatchewan growing nearly half the rye crop of Canada in 1922, shows how quickly the farmer is ready to shift to a new crop when he has been assured of its worth.

Saskatchewan stands without a rival in the production of high quality bread wheats and it would seem safe to predict that it will remain so. But fifty years hence fodder crops will be important too. Corn, legumes (such as sweet clover) and grasses (such as brome) will be commonly grown. These are links in diversification of farming practice, in spreading the risk and in maintaining satisfactory soil conditions.

II. CROP IMPROVEMENT WORK OF THE FIELD HUSBANDRY DEPARTMENT, UNIVERSITY OF SASKATCHEWAN

By MANLEY CHAMPLIN, Senior Professor of Field Husbandry

THE work of the Field Husbandry Department of the University of Saskatchewan consists of conducting experimental or research work with reference to problems that concern the Saskatchewan farmer, and following up this work by teaching in the class room and making the results known to the public by means of official bulletins, personal letters and articles for the farm papers, as well as by meeting as many as possible of the Agricultural Societies of the province during the year. A permanent staff of 12 is maintained, and during the summer this staff is increased to about 20.

Research Work

The research work occupies a field of about 160 acres adjacent to the University. This field is divided into blocks which are eight rods in width and 396 feet in length. These blocks are divided for experimental purposes into plots which are a decimal part of an acre in size. The plots for preliminary testing are .01 of an acre; those for standard tests, which are to be carried on for a long period of years, are either .05 or .08 of an acre. The plant breeding work is divided into rows of various standard lengths. The original plant selections are grown in head rows, five feet long. The second generation is grown in rod rows and the third generation in eight rod rows. Elimination each year is practised in order to keep the work within bounds. The best material from the third generation or eight rod rows is promoted to preliminary field plot tests in .01 acres. Such material is tested for a time in these plots. After this preliminary test, an effort is made to determine whether or not any of the selections or material from the breeding nursery is fit to be promoted to the standard test. Before any seed is distributed, thorough tests are made in standard plots for a long enough time to determine whether there is any possibility of its being valuable for the agriculture of the province. A few varieties are selected from the standard tests and are increased in larger fields on the seed farm which is conducted by the department on land belonging to the University. An opportunity is

plan but for increasing the seeds upon the plots used for conducting field management experiments of various kinds as well as upon the seed farm. The seeds thus obtained are distributed to Saskatchewan farmers at reasonable prices. The amounts sent out are usually limited to enough to seed ten acres. This varies slightly with different crops. During the season of 1922, 80,000 pounds of seed were distributed in the spring and 195 acres were sown on University land and produced a very fair crop, which was distributed during the ensuing winter.

The Experimental Field

The experimental field contained 4,378 plots or rows. During the past season 1,756 of these units were devoted to the study of forage crops and 2,622 were devoted to the study of grain crops. The investigation work includes the breeding of alfalfa and testing out varieties to determine their hardiness, yield, etc. Similar work is conducted with sweet clover and brome grass as well as western rye grass. These are the four leading grass or hay crops for Saskatchewan, and attention is centred upon them for the sake of developing better producing strains and learning as much as possible regarding methods of production. The work with cereals includes all of the suitable crops produced in the province, that is, wheat, oats, barley, rye, flax, peas and emmer. Wheat, oat and barley breeding are in progress as well as a limited amount of plant breeding in connection with rye and flax. Of these plots, 180 are devoted to a test of the plant food requirements of the soil in co-operation with the Soils Department. The latter department furnishes the plan for the project and the Field Husbandry Department conducts the work upon the investigation fields.

New Projects

Some of the new projects include tests to determine the best fallow substitute, studies in connection with the rotation of crops, as well as an experiment with winter wheat which promises to be interesting. The summer fallow substitutes project includes the growing of corn, potatoes, sunflowers, millet, wheat, oats, barley, and Sudan grass in rows in comparison with summer fallow. All the plots receive uniform, thorough cultivation, and wheat is to be planted upon each of the plots alike in order to determine the effect upon the growth of wheat of the various crops grown under cultivation, as compared with the yield of wheat on summer fallow. The rotation project will include a study of the fundamental principles of crop rotation which will include a study of crop rotation involving the growing of the more important crops continuously upon the same ground as well as in two or three or six-year rotation. All the experimental work is duplicated with the exception of the soil fertility or plant food test. Owing to limited space available, it was thought best to get along without duplicates with this project, in the hope that fairly accurate results might be obtained by continuing the project through a long period of years and striking averages. All this investigation work, and seed distribution is carried on with the primary object of producing results of value to Saskatchewan farmers.

Co-operative Experiments

The seed distribution work and the results of the investigation field are followed up by means of co-operative experiments with members of the Field Husbandry Association. This Association consists of about 800 farmers who are conducting field tests of various kinds voluntarily in

co-operation with the Field Husbandry Department. From the reports obtained from these men it is possible to check up the results obtained on the experimental plots at the University. Further than that, the experiments conducted by these men often result in an increased interest upon the part of their neighbours in some crop or variety or method of culture for their particular locality. The co-operative experiments during the past season included the growing of grain in rows as summer fallow substitutes, the growing of two varieties of corn representing the leading varieties of Dent and Flint corn, the trial of grass on alkali land, and the increasing of pedigreed seeds from the University.

Instructional Work

Approximately 200 students received instruction in the class rooms and laboratories of the department during the past year. The work begins with a course in Crop Production by Professor Champlin, which introduces the subject of growing crops in Saskatchewan, including tillage methods, fundamental principles of plant growth and the study of the principal varieties. The texts used for this course were prepared by Professor John Bracken, formerly head of this department, under the titles "Crop Production in Western Canada," and "Dry Farming in Western Canada." These texts are published by the Grain Growers' Guide of Winnipeg. The second year students are given thorough technical training in the production of cereal crops in North America, including the study of several score of varieties, with the object of making them thoroughly familiar with grain production methods and varieties of this continent. This course is in charge of Professor Goulden. The text used was prepared by Mr. R. Carleton, cerealist, United States Department of Agriculture. In the third year, Professor Kirk introduces the students to a technical study of forage crops, including alfalfa, sweet clover, timothy, brome grass and all of the crops that can be used to advantage for forage purposes. This course also includes a study of the more important weed enemies. In the fourth year the students are permitted to specialize. Those specializing in Field Husbandry are given a course in plant breeding by Professor Kirk, attend a Seminar and prepare a term report under the direction of Professor Champlin. All of the courses except the Seminar include laboratory work, supplemented by lectures and text book reading. It is thus possible to give the students three full courses during the first three years in Field Husbandry, and those who wish to specialize in this subject are given the fourth year's work including two full courses.

Publications

During the past year the department issued eight bulletins, including such subjects as milling value of Saskatchewan wheat, leading varieties for Saskatchewan, winter grain in Saskatchewan, etc. The department also answered about 4,000 letters of personal inquiry from farmers, and prepared a large number of mimeograph circulars and press articles for the purpose of distributing such information as was available to the public. The best co-operation has been available at all times from the press of the province and the farm papers published at Winnipeg which circulate within the province. This has proved very valuable in connection with this phase of our work.

Extension Work

It is the policy of the University for the several departments to co-operate with the Extension Service

in furnishing lecturers for meetings of the local Agricultural Societies and Grain Growers' Associations. In connection with this work the Field Husbandry Department reached a total of 2,937 or an average per meeting of 184 persons. This does not include similar work done in connection with the Better Farming Train which tours a part of the province each year. During the past year the train reached approximately 25,000 people who attended the lectures and demonstrations. In connection with the correspondence and extension work, 13,351 bulletins and circulars were mailed from this department.

MARKETING SERVICES, ALBERTA

By COLIN G. GROFF, Publicity Commissioner

THE co-operative marketing services provided by the Alberta department of agriculture, have played a very important part in the past few years, in establishing the dairy and poultry branches of farming on a more sound and permanent basis in the province.

The benefits of such services, provided during the years when agriculture in Alberta has been emerging from the pioneer stages, are now in full evidence. The farmers of Alberta, turning to-day from the wholesale cropping of grain, are seeking the safer and more substantial paths of diversified farming, and are displaying keener interest than ever before in the development of dairying, poultry raising and other branches of intensified farming. As a result of the co-operative services provided by the government, they find conditions existing under which they are enabled to market their products with the assurance of receiving full and complete recompense for their efforts in the production of quality.

Particularly is this so with reference to the dairy industry, as Alberta now occupies an enviable place in this industry in Canada, due to the services rendered by the department of agriculture, and to the very high state of co-operation now existing among all concerned in the industry to establish an unimpeded channel of trade between the producer of quality butter and the ultimate consumer.

In the earlier years of the province when the dairy industry was in its infancy, the dairy branch of the department itself operated a number of the creameries in the province, and marketed co-operatively more than half the butter output. In 1911, however, the status of the industry had improved to such a degree that the government operation of creameries was discontinued, the marketing service being maintained. By means of this service, the department undertook to market co-operatively whatever surplus product was offered, at the best price obtainable, agreements or contracts being entered into with each shipper.

During the years from 1912 onward the department has been marketing under the co-operative scheme between seven and ten per cent of the creamery butter output. In the year 1912 a total of 278,688 pounds was marketed. In 1921 the amount had increased to 852,000 pounds. The demand for the service is not so great as in former years, for the reason that the service has now accomplished one of the objects sought at its inception, namely, assistance in the stabilization of the industry and the establishment of a commercial

standardized grading system whereby the producer of quality butter would be guaranteed the top price for his product no matter where or how he marketed it. That condition exists in Alberta to-day, thanks to the services rendered by the department, and to the splendid co-operation, which has been built up among the producers and manufacturers and all other interests, to maintain the high standard reached by the industry.

Another notable success in co-operative marketing has been realized by the department of agriculture in the handling of poultry products. The remarkable manner in which the volume of business handled by this branch of the service has increased, is evidence of the benefit it is proving to the poultry producers and the industry in general.

The poultry marketing service is operated by the conjoined efforts of the officials of both federal and provincial poultry branches. The federal officials undertake a portion of the necessary field work in the education of the farmer in the use of the service, while the provincial department of agriculture handles the actual marketing of the produce, two stations being established at Calgary and Edmonton. In addition to this the provincial department does a certain amount of the field work.

The objects of this marketing service, as was the case in dairy products, is four-fold, namely: To provide an alternative outlet for those who are not satisfied with their present market. To establish a system by which quality will be recognized and the producer paid on that basis. To encourage better methods of handling the product. To develop additional markets and to stimulate a demand for the Alberta product.

The net price returned to the farmer represents the full market price possible for the product, less deductions for handling expenses and the establishment of a reasonable reserve fund.

The egg marketing service was inaugurated in 1917, when a total of 13,326 dozen eggs was handled. In 1918 poultry marketing was also undertaken, and 14,863 head were marketed. The volume of eggs handled that year had increased to 137,370 dozens. More than 80 points in the province took advantage of the service. The manner in which the business handled by the poultry marketing service has increased from year to year is set forth in the following figures:—

Year	Eggs	Poultry
1917	13,326 doz.	
1918	137,370 "	14,863 head
1919	71,894 "	68,000 lbs.
1920	171,000 "	110,385 lbs.
1921	177,800 "	203,000 lbs.
1922	435,830 "	557,000 lbs.

The very large volume of business handled during 1922 represented direct shipments from 417 individual farmers as well as shipments from egg circles with a membership of 455 farmers. A total of 158 points in the province shipped products to the government during the year.

In addition to this volume of business, shipments were also undertaken of live poultry to Montreal and Vancouver, and the results were satisfactory considering conditions. Five cars of live poultry went into the British Columbia market. The co-operative shipping of poultry by live weight from country points to the plant at Edmonton was also undertaken very successfully, the saving in freight as compared with express being considerable. A total of 15 cars of live poultry was shipped from eight different points in the province, the saving in transportation charges ranging from $1 to $5.60 per cwt.

Under the auspices of the marketing service, community killing of turkeys

was developed to a large extent. In 1921 a total of 45,000 pounds of turkeys was handled, resulting in very satisfactory returns to the producer over the ordinary market prices. In 1922 this business had increased to 128,000 pounds.

It is obvious, therefore, that this service has benefited the industry to a very great extent, although it is difficult to estimate this benefit in actual dollars and cents. In all cases the producers have received the best market price possible, in many cases the return to them being more than would have been received in the ordinary marketing channels.

The importance of such marketing services in the improvement of grade and in the extension of markets for Alberta produce, has been established. The quality of both dairy and poultry products has been noticeably improved during the past few years, and the extension of markets has followed as a matter of course. Alberta butter is being marketed abroad in increasing quantities from year to year. Alberta eggs and poultry have also found their way to markets in the East and in Great Britain. Last year a large proportion of the egg stocks held by the marketing service of the department found its way to markets in Great Britain.

With success attained in these branches of service, the department of agriculture last year added another marketing service to its list, namely, the co-operative handling of registered seed grain. This year about 15,000 bushels of Alberta's best seed is being marketed in this way, much of this grain finding its way across the line and into Eastern Canada. The manner in which the farmers have received this latest service is most encouraging, and the prospect is that a much larger volume of seed grain will be handled next season.

The new service handles nothing but registered seed grain, and handles it at a price that gives the producer a substantial return, but is not prohibitive to the buyer. The producer consigns his seed to the government plant at Edmonton, and receives an advance of 65 per cent of the price, the balance being paid to him on disposal of the grain and after deduction of handling expenses. In this connection the department has installed what has been conceded to be one of the most modern and complete cleaning and grading plants in Canada, and has set itself definitely to the accomplishment of a great improvement and development of the production of registered seed grain in the province.

THE WORK OF THE QUEBEC AGRICULTURAL ASSOCIATIONS

By OSCAR LESSARD, Secretary of the Council of Agriculture

AMONG the various agricultural organizations in which the province of Quebec takes pride, the Agricultural Associations and Farmers' Clubs, which in their respective lines, bring about the co-operation of farmers towards a common aim, that is the progress of agriculture, are worthy of special mention.

There are, in the sixty-five counties of Quebec, 89 agricultural associations, operating regularly and numbering over twenty-two thousand members, whose annual fees make a total of some $40,000. Under the wise administration of the directors of the associations, this amount is spent on various agricultural activities such as the promotion of

breeding, the organizing of competitions, the purchasing of agricultural implements and pure-bred stallions, the giving of prizes to fairs and exhibitions, in short, the stimulation and encouragement of progress in all directions. The results of this work have been very gratifying and the general prosperity of the province has been greatly increased thereby. Each year, considerable progress in the various lines has been noted by those who keep watch over the development of agriculture.

Of course, agricultural associations are not left to themselves by the Government. Their activities are closely followed by the provincial Department of Agriculture, which endeavours to co-ordinate the same and to direct them along the proper lines. For this purpose, lecturers, expert breeders and judges are placed at the disposal of the associations, and advice and information are given by the Council of Agriculture, in order to enable the associations to reach the object towards which they strive, which is, to facilitate the task of the farmer, and gradually, but surely, to develop agriculture in all its phases and in the general interest of the community.

During the last few years, special encouragement has been given by the associations to the breeding of horses, to enable the farmers, by means of premiums, to purchase high-class stallions. To facilitate this work, the Department of Agriculture granted for this purpose about $15,000 last year, and there is no doubt that this form of encouragement will be continued in the future, as it gives highly satisfactory and gratifying results, especially since the system of recording stallions was inaugurated some three years ago.

The associations also receive a regular grant from the Government, the total amount of which was over $47,000 last year. In addition to this, the Department of Agriculture subsidizes a great many live stock, ploughing, field crop competitions, etc., which are open to adult farmers as well as to their sons, who are thus encouraged to improve their methods and who take greater interest in their work on account of the prizes and honours that they receive.

Altogether, the work of the agricultural associations in this province is extremely useful, and the farmers, who take a pride in maintaining their province in the high place which it occupies in this Dominion, co-operate actively with the boards of directors, through which the various moves and schemes of development are initiated.

EARLY LAYING—ITS ECONOMIC SIGNIFICANCE

By M. A. JULL, Macdonald College, Que.

IT is apparent that to whatever extent the month that laying commences may influence monthly and annual production to such an extent the month laying commences will be of considerable economic significance. It has been shown previously (Jull, 1923) that the value of the rate of monthly production is determined primarily by the prevailing price of eggs at the time of production. It was shown that the rate of production in Barred Plymouth Rocks and S.C. Rhode Island Reds at Macdonald College reached the highest values during the months of August to February. The data on which these observations were made dealt with the production and price of eggs for the period from November to October inclusive, which has been the customary period of treating most of the data from various sources dealing with egg production. This is to be expected, since practically all of the laying contests, which have supplied most of the available data, are organized to commence on the first of November of each year. On the other hand, if it can be demonstrated that the month that laying normally commences influences subsequent production, then it is of considerable economic importance to determine the month of the year that laying should commence in order that the annual production shall have the greatest value. This, then, is the object of the present paper.

The annual egg production records of 411 Barred Plymouth Rocks are classified according to month that laying commenced. The four months of September, October, November and December are considered, inasmuch as most birds start to lay in October or November while a few early-hatched ones may start in September and late-hatched ones usually start in December. The monthly prices of eggs used to determine the value of monthly production are the average of the prices of eggs at country points in the province of Quebec for the three laying years 1918 to 1921 inclusive. They are as follows in cents per dozen: January, 67; February, 55; March, 45; April, 41; May, 40; June, 41; July, 45; August, 49; September, 53; October, 55; November, 63; December, 70.

Table I shows the number of birds that commenced laying in each of the four months, September, October, November and December, and the average number and value of the eggs laid by each group of birds and for the total number.

TABLE I.—[illegible] AVERAGE [illegible] AND THE AVERAGE VALUE OF EGGS LAID PER BIRD ACCORDING TO [illegible] LAYING [illegible] AND FOR THE TOTAL

[illegible]	No.	[illegible]	[illegible]	Average Value in $ of Eggs per Bird	Difference
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	6·80 ± 0·03	[illegible]

It will be observed, from Table I, that both the average number and the average value of eggs laid per bird was highest for the group of birds that commenced laying in October, with November second, September third and December fourth. In every case differences with their probable errors are significant. Consequently, it is obvious that the time laying normally commences does affect quite materially the value of the annual production. The particular point to be emphasized is that, not only do birds commencing to lay in October lay more eggs than birds commencing in November but that the relative value of their eggs is also higher.

The same information as shown in Table I is shown in graphic form in Fig. I.

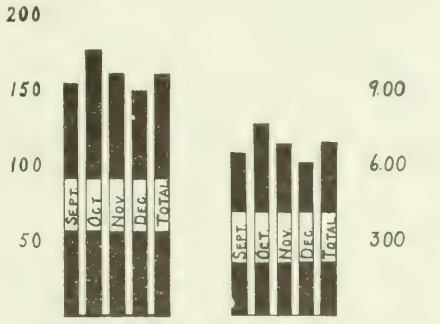


FIGURE I

TABLE II—SHOWING FREQUENCY DISTRIBUTION OF EGG PRODUCTION, IN CLASSES OF TEN, ACCORDING TO MONTH LAYING COMMENCED AND THE TOTAL

Class	Frequencies				
Eggs per Bird	Sept.	Oct.	Nov.	Dec.	Total
51 — 60				1	1
61 — 70	4			0	4
71 — 80	0			1	1
81 — 90	2		1	1	4
91 — 100	1		1	2	4
101 — 110	1		3	3	7
111 — 120	5	4	9	7	25
121 — 130	4	2	11	8	25
131 — 140	3	6	18	6	33
141 — 150	4	9	22	12	47
151 — 160	12	6	24	8	50
161 — 170	8	12	25	6	51
171 — 180	11	13	18	6	48
181 — 190	2	10	14	6	32
191 — 200	7	16	14	0	37
201 — 210	3	8	5	4	20
211 — 220	3	8	3	0	14
221 — 230		2	2	1	5
231 — 240			1		1
241 — 250			2		2
Total	70	96	173	72	411

TABLE III.—SHOWING FREQUENCY DISTRIBUTIONS OF VALUE OF EGG PRODUCTION, IN CLASSES OF $0.50, ACCORDING TO MONTH LAYING COMMENCED AND THE TOTAL

Class	Frequencies				
Value of Eggs per Bird	Sept.	Oct.	Nov.	Dec.	Total
1.01 — 1.50	1			1	2
1.51 — 2.00	4			1	5
2.01 — 2.50	2		1	1	4
2.51 — 3.00	1		4	6	11
3.01 — 3.50	7		9	7	23
3.51 — 4.00	3	5	12	9	29
4.01 — 4.50	2	4	22	6	34
4.51 — 5.00	11	10	26	17	64
5.01 — 5.50	10	11	19	8	48
5.51 — 6.00	12	17	34	7	70
6.01 — 6.50	5	13	18	4	39
6.51 — 7.00	5	12	11	1	29
7.01 — 7.50	4	12	8	1	25
7.51 — 8.00	3	7	4	2	16
8.01 — 8.50		6	2	1	9
8.51 — 9.00			1		1
9.01 — 9.50			1		1
11.01 — 11.50			1		1
Total	70	96	173	72	411

The frequency distributions shown in Tables II and III bring out the fact that there is less variability both in respect to the number and value of eggs produced by the October and November groups as compared with the September and December groups of birds. Also, the October as compared with the November group has a larger proportion of frequencies in the classes of greater magnitude.

In order to compare the results, on a percentage basis, of the September, October and December groups of birds with the November group, since November has always been considered by various authorities as the logical month to have laying commence, the November production and value figures are placed at 100 in Table IV and the figures for the other months are shown as percentages.

TABLE IV.—SHOWING PER CENT PRODUCTION AND VALUE OF EGGS FOR THE OTHER THREE MONTHS ON NOVEMBER PRODUCTION AND VALUE

Month Laying Commenced	Per Cent Production	Per Cent Value
September	96·29	95·15
October	109·77	111·61
November	100·00	100·00
December	91·53	89·12

Another way of looking at the same matter is to compare the actual value of the eggs produced according to the month laying commenced. The actual value, in cents per dozen, of the eggs laid by the four groups of birds is as follows: September, 50·00; October, 52·00; November, 51·00; December, 49·50. The differences here do not seem very great, but it must be remembered that the average for the October group than for the November group. The explanation for this is shown in Figure II, which gives the monthly distribution of the average number of eggs laid per bird for the different groups. It will be observed that the rate of production for the October group was higher than that of any other group during the months of November, December, January and February, the season of

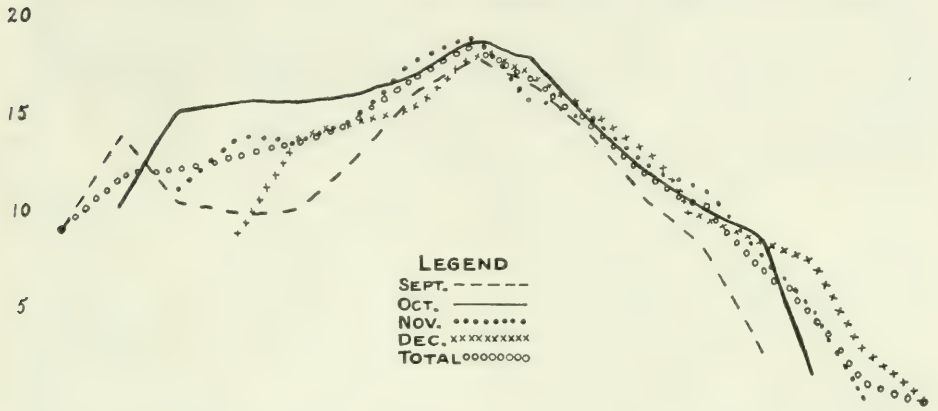


Figure II. Showing the Monthly Distribution of the Average Number of Eggs Laid per Bird.

Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
9·24	13·96	10·51	9·94	10·21	12·89	16·23	17·98	16·64	14·28	10·61	8·33	2·94	.....	.....	.....
.....	10·31	15·23	15·77	15·79	16·11	17·14	18·90	18·06	14·83	12·27	10·16	8·88	1·83	.....	.....
.....	.....	11·39	13·95	13·75	14·84	17·83	19·13	15·98	14·94	12·84	11·24	7·88	5·48	0·79	.....
.....	.....	.....	8·83	13·97	14·61	15·58	18·17	17·06	15·11	13·28	9·76	8·50	7·71	3·07	0·49
9·24	11·85	12·30	12·80	13·68	14·77	17·00	18·71	16·77	14·84	12·26	10·24	7·38	4·92	1·46	0·49

production per bird differed for the four groups, October production, for instance, amounting to 175·32 eggs as compared with November production of 159·71 eggs.

The two outstanding features developed in this paper have been: first, that Barred Plymouth Rocks at Macdonald College which commenced laying in October laid more eggs per bird than those which commenced laying in November; second, that the relative value of the eggs is greater highest prices. The rate of production for the September group is interesting from the fact that there was a noticeable drop in the rate during the months of November, December and January and that after May the rate dropped more perceptibly than in the case of the other three groups. The rate of production after April in the October, November and December groups followed much the same trend.

For the sake of emphasis, it may be repeated that the outstanding observation of this study is that the October group of birds is a more valuable gross revenue-producing group than any other group, not only because the annual production is greater, but, also, because the rate of production is greater during the season of higher prices. The more that spring and summer egg prices decrease relatively to fall and early winter prices, which seems the tendency, the more economically significant becomes the rate of production during the fall and early winter months.

The conclusion seems justified that, to whatever extent is possible, which will be discussed in a subsequent paper, birds should be hatched and reared in order to commence laying in October and that laying contests should be organized to start the first of October instead of the first of November.

LITERATURE CITED

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PART III

Agricultural Education and Related Activities

THE ONTARIO LONG COURSE SCHOOLS

By L. STEVENSON, B.S.A., Secretary and Supervising Director, Department of Agriculture

In Ontario, winter classes in agriculture and in domestic science are held by the Agricultural Representatives, and during the duration of the Agricultural Instruction Act 4,000 farm boys have benefited. Out of these classes have grown the junior farmers' organizations; of which there are 104 within the province, with a membership of 2,815. These organizations are the basis of the pig clubs, calf clubs, and various competitions in crop production, all of which are of great practical value. The three-months' courses in agriculture and domestic science now held at eight centres in the province are a similar development.—*Editor.*

THE Three Month Courses or Long Course Schools in Agriculture and Domestic Science, were organized in 1921-22 as an extension activity of the Agricultural Representatives Branch of the Ontario Department of Agriculture, in four counties, Middlesex, Huron, Peel and Wentworth. The courses were very successful, and the various groups of progressive people making use of the Agricultural Representatives' services in those counties were very desirous that the schools be repeated in 1922-23. Four other counties, Simcoe, Leeds, Prince Edward, and Peterboro' asked that the Three Month School service be extended to them. This made a total of eight counties benefiting by this form of extension work during the past winter.

The Agricultural Representative selected the location for the school in his county, arranged with the municipal authorities or others concerned for the use of buildings, grants for running expenses, equipment, prizes, and other minor essentials necessary to conduct a well organized school for rural youth.

The resident faculty at each point where a school was held consisted of the Agricultural Representative, the Assistant Representative, the Domestic Science assistant and the instructor in English and Mathematics. The travelling faculty, visiting all the schools for a definite period in accordance with a well-ordered plan, was made up of the best instructors available. This faculty was composed largely of college and university graduates with teaching experience. The Domestic Science class at each school had the benefit of a resident domestic science teacher, who in turn was assisted by the visiting specialists.

Classes were assembled at 9·30 each morning, except Saturday, and continued until four o'clock in the afternoon.

The regular students at the eight schools made a grand total of 239 boys and 260 girls. Many occasional students attended the classes of special interest to them. Literary and debating societies were organized in connection with each school.

The cost of these schools has been very low when compared with the cost of the permanent school, being

but $16 per student for the three month period, a mere trifle for well organized schooling in elementary agriculture and domestic science.

The schools were held at the following points, Clinton, Parkhill, Streetsville, Binbrook, Norwood, Wellington, Mallorytown and Orillia.

The classes in Agriculture received instruction in Animal Husbandry, Agricultural Botany, Horticulture, Farm Drainage, Soils and Fertilizers, Apiculture, Farm Mechanics, Poultry Husbandry, Farm Dairying, Farm Management, Farm Forestry, Economic Entomology, Elementary Chemistry and Physics, Civics and Rural Organization, Co-operative Marketing, Veterinary Science, Gas Engines, English, and Mathematics.

The classes in Home Economics received instruction in Sewing, Home Nursing, Foods and Cookery, Laundering, Household Administration, Millinery, English, and Mathematics. All Domestic Science students may elect to attend the classes in Poultry, Apiculture, Dairying, and Horticulture. Special lectures on subjects of interest were arranged from time to time.

Schools of this type take the college teaching into the back districts and reach young people who can not for various reasons attend the permanently organized Agricultural College at Guelph.

AGRICULTURE IN MANITOBA HIGH SCHOOLS

By R. B. VAUGHAN, Director of Technical Education

Aim and Purpose.—To develop the student's interest in the things of nature including plants, insects, birds, animals, etc., and through this aroused interest to give him a conception of the economic importance of these matters in practical agriculture.

To show that by controlling the forces of nature improvement may be made in soils, plants and animals to his own economic benefit.

To create by investigation and experimental work a scientific attitude of mind, and through the project method to give an opportunity of participation in practical production.

Policy Pursued.—To make the agricultural work of the high school appropriate to its immediate surroundings. To make the work of the school and appearance of the school lands reflect "character" that is sound, attractive and educational.

Method of Treatment.—Nature study and elementary agriculture in the grades is carefully organized so that students begin work in high school with an interest in birds, insects, plants, trees, wild animals, etc., and with a tendency for investigation. In Grade IX this natural interest is utilized by beginning the more scientific study of entomology. The student now studies the characteristics of insects by making collections of different species, and studies in particular the methods of control of about a dozen of the most injurious kinds prevalent in his own district. Birds are studied in the relationship of their economic importance to the control of insects. Horticulture is also taken in this grade and includes a study of the growing of fruits, flowers, vegetables and trees. The home is surrounded with such life and the interest in these things is natural. In the growing of fruits, the following factors are studied in considerable detail: Requirements and preparation of the soil; selection and purchasing of stock with the necessary care en-

tailed previous to and during planting; appropriate cultivation; protection from the weather, insects, diseases, etc.; gathering and marketing of the fruit. Similar study outlines are followed in the study of vegetables, flowers and trees. Considerable attention is given to improvement of plants by selection, to the construction and management of hot beds and cold frames and to the improvement of grounds. In addition to the school plots, the home project work is carried on and stimulated by home garden contests carried on under the Boys' and Girls' Clubs. These gardens are supervised and judged during the summer and prizes awarded for the best ones. The teacher of agriculture spends considerable time very profitably by becoming an extension worker during the holidays. These plots furnish the exhibits for the annual fairs of the boys' and girls' clubs.

In Grade X, Botany and Field Husbandry are combined. By this method the study of how a plant lives and grows, produces seed and fruit is treated in its proper relationship with the practical method of creating the best conditions for the plants comprising commercial crops. Due consideration is given to the suitability of field crops to different soils and their economic value due to use, marketing conditions, etc.

In Grade XI, Animal Husbandry is the main topic. Horses, cattle, sheep, swine and poultry are studied from the standpoint of history, classification, breeds, characteristics, care, feeding, breeding, exhibition, marketing and judging. As in the work of the preceding grades the local conditions are kept constantly in mind particularly with reference to selection, feeding and marketing. Practice in stock judging is given at the near-by farms. Pig, calf and poultry clubs are formed, and their very favourable progress is noted by the exhibits at the annual fair.

Progress.—The work as outlined receives credit in the regular high school course, either for entrance to normal school or to the University, and may be said to have been carried on under probationary conditions. So far as can be ascertained, the results are fully up to the expectations and giving satisfaction from the standpoint of cultural, scientific and practical education. The work carried on at Teulon, Man., under the efficient direction of Mr. S. E. Clarke, B.S.A., has become an enterprise of community significance. Some boys under his direction have produced enough good seed to sow their fathers' fields.

POULTRY CLUB WORK IN NEW BRUNSWICK

By F. LESLIE WOOD, B.S.A., Poultry Superintendent

BOYS' and Girls' Club work began in New Brunswick with the organization of two pig clubs in 1917. The following year poultry clubs were first organized, and since that time poultry club work has played an important part in the work of the Poultry Division. During the five years the work has been in progress forty clubs have been organized with a total enrolment of 521 members. To these members have been distributed 23,442 eggs and 1,290 day-old chicks, all of bred-to-lay strains of Barred Plymouth Rocks.

Below are given the rules and regulations under which the Boys' and Girls' Poultry Clubs have been organized in New Brunswick and the contract entered into by the members with the Department of Agriculture.

RULES AND REGULATIONS

Boys and Girls' Poultry Clubs

1. Club members must agree to the breed selected by the Poultry Division of the Department of Agriculture.

2. A club must have at least fifteen (15) members.

3. Boys and girls between the ages of twelve (12) and eighteen (18) years may become members of the Boys' and Girls' Poultry Club.

4. No boy or girl may join a poultry club without the consent of parent or guardian.

5. Boys and girls cannot join a poultry club unless they have the proper facilities to care for the poultry at all seasons of the year or agree to provide the same according to instructions from the Poultry Division. Members must have proper food available.

6. Members of the Poultry Club must mark their poultry of all ages in such a way as will distinguish it from other poultry raised on the same place. The members' club chickens should be raised in a separate place to other chickens if possible.

7. The club must hold an annual Poultry Fair in the fall of each year, the date selected subject to the approval of the Poultry Division. The Poultry Club Fair shall be held in conjunction with the Pig Club Fair in the same locality, and if possible on the same date as the local fair of the district.

8. All members of the club must show all their chickens at the Club Fair.

9. An annual membership fee of twenty-five cents (25c) shall be paid to the secretary-treasurer of the club by each member at the time of joining. This money shall be devoted to assisting on the business of the club.

10. The annual meeting shall be held some time in January of each year when the officers for the ensuing year will be elected by ballot. Club meetings shall be held regularly every two months, in the months of January, March, May, July, September and November. Dates of all meetings are subject to approval of the Poultry Division. This will permit the more frequent attendance of speakers arranged for by the Poultry Division.

11. Special meetings may be called by the president at any time to transact important business.

12. The secretary-treasurer shall notify all members when a general or a special meeting is to be held.

13. There shall be at least one Poultry Division will arrange for a representative to speak at the club meetings and to discuss important problems with the club.

14. The Poultry Division will supply the president of the club with papers on poultry husbandry which shall be read at the regular meetings of the club by members appointed by the president. He shall also appoint a member to lead in the discussion after the reading of the paper.

15. I hereby agree to abide by the rules of the above club and do everything in my power to promote its interests.

Signed .....

Date.....

CONTRACT

Boys' and Girls' Poultry Clubs

This contract made and entered into by and between Poultry Division, Department of Agriculture, Fredericton, N.B., Party of the first part, and..... Party of the second part, of the county of .....and Province of New Brunswick.

Witnesseth: That the party of the second part has this day secured from the party of the first part (50) Barred Plymouth Rock eggs which he or she agrees to take possession of and incubate according to instructions given by party of the first part.

That party of the second part further agrees:

To raise, feed, house, breed and market the chickens hatched from the eggs supplied, and their progeny, for two years, according to instructions from party of the first part.

To become, at the same time, a member of.....Boys' and Girls' Poultry Club, to bind himself or herself to abide by the rules and regulations of the club for two years to the best of his or her ability, to exhibit when called upon, all the chickens raised from the eggs supplied by party of the first part, at the club poultry show.

To return to party of the first part, in the fall of the year, one strong healthy chicken for each (12) eggs or (6) day-old chicks supplied. (4) chickens, or in the spring of the second year the same number of eggs of as good quality as were supplied to him the first year, whichever party of the first part desires, and to sell to party of the first part, at a rate not exceeding .....cents each as many other eggs laid during the hatching seasons of 192.. and 192.. by birds hatched from eggs supplied and their progeny, as party of the first part desires.

To report to the Poultry Division a complete record each year for two years of all chickens hatched from eggs supplied and their progeny, according to the instructions on record blanks furnished.

If sufficient chickens to fulfil this contract are not raised, party of the first part sustains the loss.

If for any reason either party shall fail to fulfil this contract or any part thereof he shall forfeit all right to the eggs, chickens hatched from them, or their progeny.

In testimony whereof the parties have hereunto set their hands this the ..... day of .....192...

.....Party of the First Part.

.....Party of the Second Part.

I hereby consent that Party of the Second Part may enter into the above contract.

.....192..

.....Parent or Guardian.

While in many other places where poultry clubs are conducted members are permitted to make a choice of varieties it was thought advisable to adopt only one variety for the work in New Brunswick. It was believed this would assist in the standardization of our poultry, the advisability of which cannot be questioned. The principal reasons for choosing the Barred Plymouth Rock breed were, as follows:

They are one of the best utility varieties, if not the best, and well suited to the farmers' needs.

Many of the Canadian and United States Experiment Stations had recognized them as such and had produced and distributed heavy laying strains.

They are the most popular and most extensively raised variety in New Brunswick.

A sufficient supply of eggs of any other suitable variety, from a nearby source, would have been impossible to obtain.

While poultry club work may not have been carried on to as great an extent as in other provinces or states, it has been encouraged so far as the resources of the Poultry Division would permit, and it is planned to continue the work.

Why are our governments laying such stress on boys' and girls' club work? There are several reasons. In many cases clubs have been started primarily to increase production of some breed or class of livestock of which larger numbers were needed.

Such has been the case in New Brunswick. The primary function of the boys' and girls' poultry clubs has been the introduction and propagation of improved strains of utility poultry. Previous to their organization but little attention had been paid to egg production in the province, and the poultry clubs were aimed to serve as community breeding centres from which quantities of high-class breeding stock and hatching eggs would be available in a short time.

A second reason for carrying on club work has been to get farm boys and girls interested in farm work and in this way stop, to some extent, the rural depopulation which has been going on for so long to the detriment of the farming communities. Club work furnishes an effective means of reaching, holding and directing the interest and energies of boys and girls who are without as well as within the schools, and so promotes the betterment of the social, educational and economic conditions affecting country life.

A third reason for carrying on the work is its educational value. A club may aim to educate its members only along one particular line of work, but the interest aroused is extended to other matters and to the improvement of rural conditions generally. Gradually but surely club members learn that it is not all of farming to drudge; that there is abundant opportunity to plan, study, investigate; that intelligence and culture are needed on the farm, and that the proper exercise of these qualities will yield as abundant returns in the country as in the city.

The poultry club fair held annually in each district where a club has been formed has been of great educa-

tional value. The persons who judge the fowls exhibited make an effort to point out the points of excellence or the deficiencies of the different birds, and thus each member has the opportunity of gaining valuable information.

Club members have been visited as often as time would permit, and individual assistance has been given in the many problems that confront the poultry breeder. Meetings have been held and demonstrations of different kinds given in an effort to give all the information possible to interested members.

Finally, by bringing together the boys and girls at club meetings and club fairs, social conditions may be improved. This is particularly so in outlying rural districts where isolation has been the greatest hindrance in agricultural progress. If the social instinct of the boys and girls can be developed in this way, a vast amount of good will result.

I wish to mention briefly some of the results that have been attained by club work in New Brunswick. It has wielded a widespread influence for more and better poultry. There is plenty of evidence to show that the clubs have fulfilled the primary function for which they were instituted—to assist in the transmission of heavy-laying strains of poultry. Even in sections far removed from club flocks, birds are found that bear unmistakable traces of the blood of strains introduced for distribution to poultry clubs. In many cases the clubs have demonstrated that poultry raising is a successful venture where it had been viewed with doubt previously. It is not to be expected that every club member will become an enthusiastic poultry breeder, but the work has brought to light a large number of enterprising boys and girls who are greatly interested, and are making a financial success of poultry raising. Frequently the parents have become interested through the success of their children and, with the parents approval secured in this manner, the chances for continued success look exceptionally bright.

The standing made by fowls bred by club members in the laying contests during the past four years speaks well for the results of the members as breeders and for the quality of the stock introduced by the Poultry Division for distribution through the clubs.

The first Egg Laying Contest in which club members from New Brunswick took part consisted of twenty pens and was held at the Dominion Experimental Farm at Charlottetown, P.E.I. At the close of the eleven month period the pens owned by the two club member entrants from New Brunswick stood third and sixth respectively.

A contest running for the full period of twelve months, was held the following year at the Dominion Experimental Farm at Nappan, N.S. Five pens were entered from New Brunswick poultry clubs and these won the first, third, fourth, fifth, and sixteenth places with twenty pens competing.

In the fall of 1920 the first New Brunswick Laying Contest began at the Dominion Experiment Station, Fredericton, with twenty-one competing pens of which four were owned by club members. At the conclusion of the contest these stood in seventh, ninth, tenth and twelfth places.

At the second New Brunswick contest which ended October 31, 1922, poultry club members claimed second, third and thirteenth places among twenty competing pens.

This record is considered particularly good since club members were competing against old and experienced breeders and against the best stock that the Experimental Stations had produced.

If individual members of a club were unable to make up a sufficiently promising contest pen, a number of members contributed the best from their flock and the pen was entered as a club pen. The advertising gained by successful participation in egg-laying contests has created a demand from the members of these clubs, and the members have thus had a valuable lesson in the benefits of organized effort.

Not only have club members made a good showing compared with others participating in the egg-laying contests, but each successive year finds the average number of eggs per pen higher than the previous year. Thus in 1919 the pens owned by club members in the Charlottetown Egg-Laying Contest averaged 1,177 eggs. The following year at Nappan the average was 1,415, while at Fredericton in 1921 and 1922 the averages were 1,589 and 1,617 eggs respectively. It should be again pointed out that the average for the Charlottetown contest is for eleven months only while the other three contests were for a full yearly period.

A great improvement in poultry houses can be noted in districts where clubs have been located. Many new and up-to-date ones have been built, and many of the existing ones have received much needed repairs or alterations.

These results have been obtained in a province where lumbering and fishing rank high as important industries and where farms are scattered so as to make club work more difficult than in more intensive farming districts. Results should be proportionally greater under more favourable conditions.

So far I have mentioned mainly the material benefit to the province or the poultry industry generally. Greater than this is the benefit that comes to the club members and to the communities in which the clubs are located.

Individually, members have been led to observe more closely; they have been taught to recognize the good and bad qualities in the birds they have grown. They have learned something of the value of labour, the cost of production and the keeping of simple accounts. They have been supplied with up-to-date pamphlets and bulletins dealing with poultry topics, have been encouraged to read good literature and have been put in touch with some of the best agricultural publications. Their views have been broadened and their power of initiative has been developed. Collectively they have learned the value of organized effort and of co-operation. The social instinct has been developed—a matter of importance in outlying districts.

The influence on the community at large, the parents as well as the children, has been wholesome. It often happens that the farmer may be reached through his children where otherwise it would be impossible to give him assistance.

Improvement in one line leads to improvement in another, and thus the work has a far-reaching effect in community betterment. Although poultry club work in New Brunswick has had its discouraging features at times, in the end results have been most gratifying, and the clubs, though somewhat crude in their organization, are accomplishing much good and are worthy of encouragement.

SHORT COURSES IN SASKATCHEWAN

Poultry Course

A VERY successful poultry course of two weeks' duration was concluded at the Saskatchewan College of Agriculture on February, 1923. This was one of the extension courses, and was conducted by the poultry department under the direction of Professor R. K. Baker. Eighteen students attended, and they expressed themselves as very satisfied with the course.

Professor Baker dealt largely with selection for egg production and contributory subjects, and also covered such matters as housing and feeding. Mr. T. Hampson, also of the poultry department, gave demonstrations in killing, plucking and dressing poultry, and assisted with other laboratory work. Outside assistance was contributed by M. C. Herner, Professor of Poultry Husbandry at the Manitoba Agricultural College, who gave instruction in judging exhibition birds, and by W. H. Boyle, President of the Saskatchewan Provincial Poultry Association, who demonstrated candling methods and also gave an address on matters relating to shipping.

Very particular interest was displayed in selection methods, and it is felt that a more comprehensive and convenient course should be offered in 1924 in order to satisfy the desire for more training on the part of many poultry raisers. There are many indications that interest in poultry in Saskatchewan is rapidly increasing.

Threshing Machine Course

Exceptional success attended the innovation, by the Saskatchewan College of Agriculture, of a short course in January, 1923, in the adjustment, operating, care and repair of threshing machines. This was put on as one of the extension courses and conducted by the Agricultural Engineering Department. It being an entirely new course, the attendance was a rather doubtful quantity, but it became very evident shortly after its announcement that the course would be exceptionally popular. The total enrolment was 103 students, composed largely of actual threshing machine owners.

Instruction was given in the following: Power and Speed; Pulleys, Belts and Belt Lacings; Babbiting; Cylinders and Concaves; Journals and Boxings; Feeders and Feeding; Cleaning the Grain; and Setting the Machine and Belt Alignment. The course was very practical, each student receiving practice in babbiting, lacing belts and machine adjustment. A lecture on Weed Control was also contributed by the Field Husbandry Department.

With more attention given to proper threshing machine adjustment and operation, a considerable saving of grain could be effected each year. It should also add greatly to the life of the threshing machine and at the same time lessen the cost of its operation. The unqualified success of this first course constitutes a mandate that similar instruction be provided for threshermen again next winter.

Gas Engine Courses

Two courses on Internal Combustion Engines were offered at the College of Agriculture, each being of about three weeks' duration. The January course enrolled 71 students and the February course, 55. Although similar courses have been held annually for a number of years, they continue to be very popular. Thorough instruction is given in the principles and operation of internal combustion engines.

PART IV

Special Contributions, Reports of Agricultural Organizations, Publications and Notes

ECONOMICS OF IRRIGATION PRACTICE

The Second of a Series of Three Articles by W. H. Snelson, Senior Irrigation Specialist, Irrigation Branch, Dominion Reclamation Service, Department of the Interior

Irrigation Investigations

IRRIGATION investigations to determine the water requirements of crops, the most economical methods of applying water, and the crop rotations suitable for maintaining soil fertility have been conducted in Southern Alberta by the Irrigation Branch of the Dominion Reclamation Service since 1913. As a result of these investigations considerable data are now available bearing on the economics of irrigation practice. Many of the settlers of the more recently constructed irrigation projects are now confronted with the problem of making an irrigated farm pay, and the necessity of practising more intensive farming methods. It has been considered advisable by the Irrigation Branch to provide these settlers with such information, gained from direct observations at the irrigation experiment stations, as will be of assistance to them in choosing suitable crop rotations and in so preparing and irrigating their land as to ensure the maximum possible crop returns per acre with the least possible cost for water and labour.

High Cost of Inexperience

Ignorance of economical irrigation methods is costly. It needs but a brief trip through almost any of the new irrigation projects to convince one of the need of work to be done along educational lines by means of lectures, irrigation demonstrations, and irrigation experiment stations. In spite of the fact that they already have a heavy burden to bear as payments on principal, interest and maintenance, farmers will be found who are unnecessarily increasing that burden by applying, in some cases, twice the quantity of water that the soil can hold to advantage and thereby not only doubling the water cost per acre but at the same time wasting valuable plant foods by leaching them out of the soil through percolation.

Inexperienced irrigators increase the cost of the crop grown by using too small an irrigating head and inadequate ditches—taking probably ten hours to irrigate an area of land that could be irrigated in one-half that time by proper methods.

Far too many farms will be seen in these new districts where no provision has been made for the maintenance of the fertility of the soil and on which the cost of growing a bushel of grain in sometimes double what it should be for water application only.

The above conditions are regrettable and should be ameliorated as soon as possible by educational work along the lines heretofore mentioned. They may, to a great extent be elim-

mated as much reliable information bearing on irrigation farming and related enterprises has been obtained by careful research work and is now available.

Economic Factors

In any study of the factors having a direct influence on the success or failure of the irrigated farm, three stand out pre-eminently: 1—the conveyance and application of water to the land; 2—the maintenance of soil fertility; and, 3—the cost of labour.

Water Economy

As the basis for a proper appreciation of the factors appurtenant to water economy it is well to consider that each and every acre-foot of water received by the irrigator at his main headgate and conveyed by field laterals to his crops costs a certain sum of money; where the land irrigated is served by a pumping unit and the water is sold at a fixed price per acre-foot, the cost will be more readily appreciated perhaps than where the water is sold to the irrigator at a flat rate per acre per annum whether it is used or not. Under any system of charges however, there is always the cost of irrigator's wages per acre-foot applied, the cost of replacing plant foods leached from the soil by over-irrigation, and the cost of the construction and maintenance of field laterals.

Water economy means then that no more water be applied to a crop than can be retained within the feeding zone of the plant roots and used to advantage by the crop; that percolation and evaporation losses be reduced to a minimum by properly constructed field laterals and well levelled land; and that water requirements per unit of yield be decreased by maintaining the fertility of the soil.

1. Losses in Transit:

Where field laterals are run on too flat a gradient, considerable losses of head occur by percolation; where laterals are too small, the irrigator is forced to work with an inadequate head of water, and finds it difficult to spread the water and secure a uniform irrigation. Very flat gradients favour the deposition of silt and the growth of weeds—both of which lower the carrying capacity of the ditch.

2. Losses in Application:

Avoidable water losses in application occur in two ways—by deep percolation and by surface waste, and are caused by: (*a*) lack of proper preparation of the land; (*b*) ditches spaced too far apart considering the irrigating head available, the texture of the soil, and the slope and surface preparation of the land, and (*c*) too frequent or too large applications of water.

Economical irrigation consists in applying to a crop sufficient water to raise the moisture content of the soil occupied by the feeding plant roots to the optimum percentage for growth, with the least possible loss from deep percolation. In general practice this will require the application of an irrigation of from four to six inches in depth.

To apply light irrigations requires that the water be quickly and uniformly spread over the surface of the land, and this in turn requires that the land be well levelled and floated, with all knolls cut off and all depressions filled, and that the ditches be spaced close enough together to permit of a quick and even spread of water with the irrigating head available. Where the land has not been properly levelled, the irrigator, in his efforts to place water on the high spots will unavoidably over-irrigate the low spots, thus drowning out the crop in the depressions and losing water by deep percolation.

On poorly prepared land, the irrigator can rarely use an irrigating head in excess of two or three second-feet and will lose much of that by surface waste, whereas on well prepared land, and especially under the border system of irrigation, heads as high as fifteen second-feet can be used to advantage.

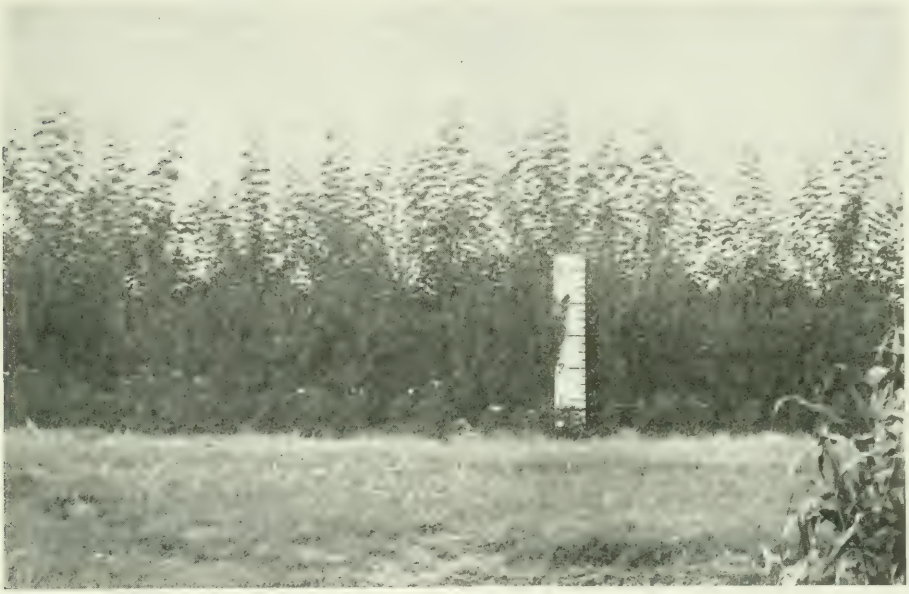
On well graded land of gentle slope ditches should be spaced not over sixty feet apart if an irrigating head of one second-foot is used, one hundred feet apart if a head of from two to three second-feet is used and one hundred and fifty feet apart if a head of from three to five second-feet is used. In general, these distances may be increased fifty per cent where the soil is heavy and impervious or where the land is in well established alfalfa or grass meadows, and should be decreased for open sandy soils.

Irrigation investigations carried on for five years at the Dominion Irrigation Experiment Station at Brooks, Alberta, have produced reliable data showing:—

1. That wheat, oats and barley require about twenty-one inches of water to produce their maximum yields per acre.

2. That this amount of water is most economically applied in light applications of from four to six inches in depth each.

3. That in years when the precipitation was only five inches during the growing season, maximum yields were produced where the sixteen inches of water, needed as irrigation to make up the amount required to mature the crop, was applied in four irrigations of four inches depth each—the first irrigation being applied the last week in May and the next three irrigations being spaced about fifteen days apart.



Three-year old Tree Plantation at Brooks Irrigation Experimental Station

These same investigations have demonstrated that a given quantity of water, if applied to grains in four-inch irrigations, would produce a

greater yield per acre than if applied in six-inch or irrigations of greater depth. The lighter irrigation was sufficient to supply the moisture deficiency within the zone occupied by the grain roots; when irrigations in excess of four inches were applied, that excess could not be retained in root zone and was lost to the crop by percolation.

Deep percolation losses, due to excessive depths per irrigation, will amount to a very large portion of the losses occurring on an irrigated farm and cause a direct loss to the irrigator not only because payment must be made for the application of quantities of water to the land that cannot be retained for use, but also because this excessive percolation not only leaches valuable plant foods from the root zone, but by raising the general level of the ground-water, contributes to the rise of injurious alkalies on lower lying lands.

In summarizing the factors that make for economy in the conveyance and application of water the following are of the utmost importance:

1. The land must be well graded and smoothed.

2. Ditches must be large, well built, laid on a proper gradient and kept free from weeds and silt.

3. The ditches should be so spaced as to permit of a quick and uniform irrigation with the irrigating head available.

4. The proper quantity of water should be applied at such times and in such amounts as will ensure maximum yields and prevent percolation losses.

Effect of Depth per Irrigation on Labour Cost

Studies of the water holding capacities of typical southern Alberta soils and of the depths to which grain crops penetrate and utilize the moisture have shown that it is rarely possible for an irrigation in excess of six inches in depth to be entirely retained in the zone of soil occupied by the plant roots and utilized by the crop. Experiments on the irrigation of grains have demonstrated that a given quantity of water, if applied in four-inch irrigations, will usually produce a greater yield per acre than if applied in six-inch irrigations. On the sandy soil of the Strathmore experiment station the soil will not hold more than a four-inch irrigation, therefore, if an irrigator applies, say, an eight-inch irrigation to soil of this nature, it is costing him double what it should for the labour of applying the water as the extra four inches are lost to the crop by percolation.

When a farmer is irrigating with an average head of about two cubic-feet per second, the labour cost of spreading that water is about 17½ cents per acre-inch. In a ten-hour run the stream will have delivered twenty acre-inches of water at a cost for irrigator's time of $3.50. If the land is given a four-inch irrigation, the irrigator will be able to cover five acres at a cost of 70 cents per acre; if the land is given a six-inch irrigation, only three and one-third acres will be covered and the cost per acre for irrigator's labour will be $1.05 per acre.

Effect of Correct Ditch Spacing on Labour Cost

Where the distance between ditches is too great a high percolation loss occurs. The land does not receive an irrigation of uniform depth and the cost per irrigation is increased by the amount of water lost by percolation near the supply ditch before the farther lying portions of the land or border have received an adequate amount. Where four-inch irrigations could be applied with ditches 100 feet apart, it would require six-inch irrigations to uniformly cover the land if the same head of water were used with ditches 150 feet apart.

Effect of Preparation of Land on Labour Cost

Where the land has been well prepared, light irrigations are possible. Where poorly prepared, much water is lost by surface waste. In extreme cases on rough rolling land as high as fifty per cent of the water supplied will be lost by percolation and surface waste, thus doubling the cost of irrigator's labour per acre.

The same man, who only irrigates three or four acres per day on rough land or on unfloated breaking, can irrigate as high as ten or fifteen acres per day where the land has been properly prepared for irrigation.

THE CARTER MEDAL AWARDED

MR. W. T. MACOUN, Dominion Horticulturist, was selected by the special committee of the Canadian Horticultural Council as the first recipient of the Carter Medal for outstanding service in connection with Horticulture.

The presentation was made by the donor, Mr. J. E. Carter, of Guelph, Ontario, on the occasion of a dinner held in connection with the annual meeting of the Horticultural Council at Ottawa in March last. Those in attendance included the Dominion Minister of Agriculture, the Hon. W. R. Motherwell, the Deputy Minister, Dr. J. H. Grisdale, the members of the Council's Executive, and also representatives of the Ottawa Horticultural Society and of the Ottawa Vegetable Growers' Association. Mr. Carter intimated that a fund had been established which would provide for an annual medal in perpetuity. The medal would be awarded each year, to the individual selected by the Council, for services in advancing horticulture in Canada.

In an appropriate expression of thanks, Mr. Macoun made the statement that as a recognition of horticultural achievement, the awarding of the Carter Medal would do much to inspire effort and thus contribute to advancement in the field of horticulture.

The following statement sets forth Mr. Macoun's activities:—

Mr. W. T. Macoun, Dominion Horticulturist, entered the Government service in 1888, or about 35 years ago. For the first ten years he assisted the late Dr. Wm. Saunders, then Director of Experimental Farms, in horticultural work and in experiments with cereals. In 1908 he was appointed Horticulturist to the Central Experimental Farm, Ottawa, and Curator of the Arboretum and Botanic Garden there, in which position he remained until 1910, when he was made Dominion Horticulturist, and his duties were broadened to include the oversight of the horticultural work of the whole of the Experimental Farm System.

During his term of office Mr. Macoun has written many valuable and exhaustive bulletins including "The Apple in Canada, and Its Cultivation"; "Plum Culture"; "Bush Fruit Culture"; "Strawberry Culture"; "Potato Culture"; "Hardy Roses in Canada"; "A list of the trees and shrubs tested in the Arboretum with notes on their Hardiness"; "List of Herbaceous Perennials tested in the Botanic Garden with descriptions of flowers and dates of blooming"; and many minor pamphlets and circulars on special crops. These, in addition to his annual reports and addresses given before many meetings in different parts of Canada, have been of much aid in the advancement of horticulture in the Dominion.

During the war, Mr. Macoun was particularly active in promoting the growing of vegetables on vacant lots and in home gardens and in issuing special pamphlets to aid in this work. Through his efforts, household canning was much encouraged during the war, the best methods of canning and preserving fruits and vegetables were demonstrated, and a bulletin on this subject based on experimental work done at Ottawa was distributed throughout Canada.

While many experiments with fruits, vegetables, and ornamental plants have been conducted at the Experimental Farm, Ottawa, under Mr. Macoun's direction, his special personal attention has been given to the breeding of fruits. Beginning

Mr. W. T. Macoun, Dominion Horticulturist, First recipient of The Carter Medal.

this work with the late Dr. Wm. Saunders over thirty years ago, he has continuously sought to improve on existing varieties, and many very promising new sorts, especially of apples, have resulted from his efforts. These include the Melba, Joyce, and Lobo varieties of apples. He also continued the work begun by Dr. Saunders many years ago in breeding apples especially suited for the prairie provinces, and at the Experimental Station, Morden, Manitoba, the best collection of hardy apples in America has been brought together by him.

The work of improvement is not, however, confined to fruits for, under his direction, his assistants are engaged in the breeding of vegetables and flowers of various kinds. As chairman of the Committee of Registration of the Canadian Horticultural Council, he has helped to prepare a workable scheme of registration, and the final judgment of the merits of plants proposed for registration has been left to the Dominion Horticulturist.

It is of interest to note that Mr. Macoun was intimately associated with the early history of the famous Marquis wheat. From 1892 to 1898, as Assistant to the Director of the Experimental Farms, Mr. Macoun had full charge of the new wheats produced at the Farms. It was at the commencement of this period that Marquis wheat had its beginning. While many crosses made at that time were subsequently discarded, the promising properties of Marquis were discerned by him and the variety was saved for further study.

PRINCIPAL OFFICES HELD AND BEING HELD BY W. T. MACOUN, DOMINION HORTICULTURIST

American Pomological Society: Vice President 1915-1923.

American Society for Horticultural Science: President 1912; Vice President 1910, 1917, 1918; Member of the Executive 1913, 1914, 1917.

Potato Association of America: Vice President 1917-1919.

Great Plains Section of American Society for Horticultural Science: President 1922.

Ontario Fruit Growers' Association: Director, District No. 1, 1919-1923.

Quebec Pomological Society: Life Member (Honourary) 1907.

Nova Scotia Fruit Growers' Association: Honourary Member 1899-1923.

Ottawa Field Naturalists' Club: President 1903-5; Council, 1897, almost continuously to 1923.

Ottawa Horticultural Society: President 1899; Ex Officio Member of Board of Directors 1905-1923.

Royal Horticultural Society: Member 1909-1923.

American Association for the Advancement of Science: Member 1918-1923.

Canadian Society of Technical Agriculturists: Member 1920-1923.

Ottawa Improvement Commission: Commissioner 1920-1923.

Canadian Horticultural Council: Chairman Registration Committee 1922-1923.

DAIRY PRODUCE GRADING

Summary of Regulations Governing the Export of Cheese and Butter

THE regulations adopted under The Dairy Produce Act, in effect April 1, 1923, provide that all creamery butter and factory cheese of Canadian origin shall be graded, before being exported, at such time and place as may be decided upon by the Dairy and Cold Storage Commissioner or by the Chief Dairy Produce Grader. Due consideration must be given to the convenience of the manufacturer and exporter, and the usual course of trading is to be interfered with as little as possible. All packages containing butter and cheese are to be marked at the factory in the following manner: Every churning is to be given a number, and this number is to be marked plainly and legibly on the side of each package containing butter. Every vat or batch of cheese is to be given a number and said number is to be marked in a similar way on all the cheese from the vat or in the batch and on all boxes containing the cheese. The numbering must be done consecutively in each case, starting from No. 1 throughout the shipment, whether of butter or cheese. The grader is to select one cheese from each vat and one package of butter from each churning in every shipment and grade the selections in one lot. In case the shipment differs widely in quality as between different vats or churnings the shipment may be divided into different lots of different grades.

In grading factory cheese, the Dairy Produce Graders are to be governed by the following standards and points: flavour 45 points; texture 25 points; closeness 15 points; colour 10 points; finish 5 points. The grades are: "Special Grade," for which the total score is 94 and over and the minimum score for flavour is 41; "First Grade," or finest cheese, total score 92 and under 94, minimum score for flavour, 39; "Second Grade," or fine cheese, total score 87 and under 92, minimum score for flavour 37; "Third Grade" cheese, total score under 87, score for flavour under 37.

The standards for butter are: flavour 45 points; texture 15 points; incorporation of moisture 10 points; colour 10 points; salting 10 points; packing 10 points. The grades are the same as for cheese, and the allowance in points for each of the four grades is the same as for cheese, but "Special Grade" butter must be made from properly pasteurized cream, showing no reaction by Storch test.

The grader is to issue a certificate signed by himself for each lot of cheese or butter, giving all the particulars, with special information as regards colour of both commodities and as to the percentage of salt in the butter. Pasteurized butter will be so endorsed. The owner of the butter or cheese is required to arrange a suitable place for inspection, and to open all boxes or packages. If the marking is omitted, or there is any irregularity in the marking, the grader may examine the shipments and impose a fine of five cents for each package. No cheese or butter will be examined unless it indicates the factory where it was made. No cheese will be graded until it is sufficiently mature to permit of the quality being determined. A grader may refuse to grade any butter or cheese not of temperature to permit proper examination. No package may be changed or marked in any manner inconsistent with the official stamping after grading has been done. If the regulations have not been complied with, the grader may hold any lot of butter or cheese until they have been met.

CONFERENCE OF EXPERIMENTAL FARM SUPERINTENDENTS

THE holding of this conference, the first since 1915, was approved by the Honourable the Minister of Agriculture early in January, and an invitation was immediately sent to the Superintendents of the Branch Farms and Stations to be present at Ottawa on February 6-10 inclusive, 1923.

The Superintendents reporting for the Conference were as follows: Charlottetown Experimental Station, J. A. Clark; Kentville Experimental Station, W. S. Blair; Nappan Experimental Farm, W. W. Baird; Fredericton Experimental Station, C. F. Bailey; Ste. Anne de la Pocatière Experimental Station, J. A. Ste. Marie; Lennoxville Experimental Station, J. A. McClary; La Ferme Experimental Station, P. Fortier; Kapuskasing Experimental Station, S. Ballantyne; Brandon Experimental Farm, W. C. McKillican; Indian Head Experimental Farm, N. D. MacKenzie; Rosthern Experimental Station, W. A. Munro; Scott Experimental Station, M. J. Tinline; Lethbridge Experimental Station, W. H. Fairfield; Lacombe Experimental Station, F. H. Reed; Summerland Experimental Station, R. H. Helmer; Invermere Experimental Station, R. H. Newton; Agassiz Experimental Farm, W. H. Hicks; Sidney Experimental Station, E. M. Straight; and Experimental Sub-station, Beaverlodge, Alberta, W. D. Albright; Tobacco Station, Farnham, J. E. Montreuil; Tobacco Station, Harrow, D. D. Digges.

Dr. G. A. Langelier, Superintendent at Cap Rouge, Que., and Mr. W. R. Leslie, Superintendent at Morden, Man., were unable to be present on account of illness.

The programme of the conference was so arranged as to give opportunity for the discussion of all lines of experimental work with the officers in charge of those divisions of the work at Ottawa, and, in addition, general meetings were held for the discussion of wider phases of administration and policy.

On the evening of February 8, the Deputy Minister and the Director held a reception at the residence of the former on the Central Farm, thus giving the Superintendents an opportunity of meeting the entire staff of the Central Farm and the heads of the other branches of the department.

The Superintendents presented a resolution of thanks to the Minister, the Deputy Minister, and the Director of Experimental Farms for having called the conference.

ASSISTED IMPORTATION OF RAMS AND BOARS

BREEDERS of purebred sheep and swine have for some time realized the need of imported blood to supplement foundation stock in the Dominion. At the request of Breeders' Associations, a plan has been worked out whereby the Live Stock Branch of the Dominion Department of Agriculture and the various Provincial Departments of Agriculture will defray all purchasing and transportation costs in connection with the importation of rams and boars from Great Britain, thus permitting Canadian breeders to secure the best of British stocks at the actual cost in that country.

In sheep, this assistance will be expended to those breeds that are recognized as of special commercial value in the production of choice quality market lambs, and at the same time produce wool of the better marketable grades. Assistance for boars will be confined entirely to the recognized bacon breeds.

SCHOLARSHIPS IN AGRICULTURE

IN order to encourage post-graduate study, the firm of W. C. Macdonald Registered, through its President, Mr. Walter M. Stewart, has offered one scholarship to each of the provinces, open to agricultural graduates, tenable for one year at Macdonald College, and valued at $500 for the scholastic year.

The scholarships for British Columbia, Alberta and Saskatchewan are offered to agricultural graduates of the faculty of agriculture of the respective universities. Failing such, to any graduate in agriculture resident in each of these provinces. In Manitoba, the scholarship is offered to a graduate of the Manitoba Agricultural College. In Ontario, to a graduate of the Ontario Agricultural College. In Quebec, two scholarships are offered. One to a graduate of the Agricultural Institute of Oka (University of Montreal), and one to a graduate of the Agricultural School at Ste. Anne de la Pocatière (Laval University). In the Maritime Provinces, scholarships are awarded through the respective Secretaries or Ministers of Agriculture to agricultural graduates resident in the provinces, preference being given to men who have had two years' training at the Truro Agricultural College and two years at some other agricultural college. Failing such candidates, they are open to any agricultural graduate resident in each province.

If these scholarships are not filled by the respective provinces by the first of July, they are left at the disposal of the Principal of Macdonald College.

NEWS ITEMS AND NOTES

The first shipment of Canadian store cattle for the British market since the removal of the embargo was personally inspected at Montreal by the Dominion Minister of Agriculture, Hon. W. R. Motherwell, the Deputy Minister, Dr. J. H. Grisdale, and other officers of the Department of Agriculture, as well as by several Members of Parliament. There were 427 animals in the shipment, mostly of the Shorthorn and Polled Angus types, and of good beef quality. The Minister stated his belief that the resumption, after a period of 30 years, of store cattle shipments would lead to the gradual development of an important export trade.

The gift to Canada of five breeding Shire horses, two stallions and three mares, by the Shire Horse Society of Great Britain, has been added to by Mrs. Stanton, of Derbyshire, England, who has contributed a two-year-old colt from her famous stud at Snelston, near Ashbourne.

This colt is the son of one of the best bred mares in the Empire, and by a very famous sire—one time champion of the breed in the British Isles.

Mr. Arthur Gibson, Dominion Entomologist, and Mr. H. T. Güssow, Dominion Botanist, have been authorized to attend an important international conference on economic entomology and phytopathology, which has been called by the Dutch Government to take place at Wageningen, Holland, June 25 to 30.

It is expected that delegates from various countries will be present to discuss matters relating to international laws, control of insects and diseases, etc.

While in England and on the continent Messrs. Gibson and Güssow will visit various entomological and pathological stations and also a number of the larger nurseries.

Hitherto eggs imported into Canada in less than ten case lots have not been subjected to inspection, and by making small consignments, shippers were able to evade the regulations. The regulations have now been amended, and all shipments of eggs in the shell will henceforth be subject to inspection and marking at the port of entry.

The Minister of Agriculture, Hon. W. R. Motherwell, announces that the Dominion Government Seed Purchasing Commission will cease to function in the purchasing and distribution of seed grain. The Seed Purchasing Commission was organized under the Dominion Seed Branch in 1916 for the purpose of supplying seed grain at approximate cost to farmers in localities having a complete or partial crop failure. The development of the seed grain trade has since made steady progress, and the proportion of the requirements handled by the Commission has decreased correspondingly from year to year since 1919.

The Seed Purchasing Commission functioned for six years without cost to the country, and prevented, during that period, a seed shortage in any part of Canada.

For the six months ending February 28, 1923, Canadian wheat exported to the United Kingdom amounted to 130,244,830 bushels, compared with 75,057,650 bushels during the same six months of 1921-22. Wheat exported to the United States during the six months amounted to 9,615,909 bushels, compared with 9,413,971 bushels for the same period of 1921-22. Canada's total wheat exports for the six months totalled 159,680,596 bushels, as against 103,727,326 bushels exported during the same period a year ago.

The total wheat flour exported during the six months was 6,034,499 barrels, value $33,818,380, as compared with 3,920,520 barrels during the six months ending February 28, 1922.

The dairy industry in the Argentine has shown constant and remarkably rapid growth in recent years. In 1910 the production of butter was 16,617,000 pounds, and of cheese, 6,045,000 pounds. By 1921 butter production had increased to 72,294,000 pounds and cheese production to 52,265,000 pounds.

This expansion of the Argentine dairy industry is making available on the English markets large quantities of Argentine butter in competition with that from other exporting countries. It is also placing large quantities of cheese on American markets.

The average value of the occupied farm lands of Canada, which includes both improved and unimproved land, together with dwelling houses, barns, stables and other farm buildings, is returned as $44 per acre, as compared with $40 in 1921, $48 in 1920, $46 in 1919, $41 in 1918, $38 in 1917, $36 in 1916 and $35 in 1915. By provinces, the value for 1922 is highest in British Columbia, viz., $120. In the other provinces the average values of farm lands per acre are reported as follows: Ontario $64; Quebec $58; Prince Edward Island $45; Nova Scotia $34; New Brunswick and Manitoba $32; Saskatchewan $28 and Alberta $24.

The average values in 1922 of orchards and fruit lands, including buildings, etc., in the fruit growing districts of Nova Scotia, Ontario and British Columbia are estimated as follows: Nova Scotia $93 ($117); Ontario $127 ($137); British Columbia $320 ($300).

During the fiscal year ending March 31, 1923, the number of books borrowed from the Library, International Institute Branch, Dominion Department of Agriculture, was 5,029. The number of persons availing themselves of the privilege of borrowing was 581, including Federal departmental officials, and those connected with agricultural extension, teaching and research in each of the provinces of the Dominion.

As an outcome of breeding work by the department of field husbandry of the University of Alberta, a new wheat has been produced for the limited rainfall areas. Professor G. H. Cutler states that this wheat, as shown by an average of three years' tests, is five inches taller than Marquis and three days later in maturing. Its milling and baking qualities are the equal of Marquis, based on tests conducted by two independent research laboratories in Winnipeg. For the same three years' trials in competition with Marquis and Red Fife, it has outyielded both of those varieties by a little better than nine bushels per acre.

The wheat gives promise of fulfilling the purposes for which it was bred, namely: (1) to give greater length of straw in limited rainfall areas, where in dry years straw is so short as to make harvesting difficult, (2) to offset decrease in yield due to reduction of soil fertility, and (3) to reduce production cost through increased yield. Seed is not yet available for distribution.

An agricultural school is to be provided at Fredericton, New Brunswick, from the grant allotted to that province for agricultural instruction. The school is to be located at the Dominion Experimental Farm, Fredericton. Construction will be proceeded with at once so that the building may be ready for use in the autumn, when the first courses will be given.

Demonstration or "Better Farming" trains have been a notable feature of the work of extension in Saskatchewan, where they have been operated regularly, with one exception, since 1914. These trains, staffed by experts and equipped with exhibits, have been termed "A College on Wheels." The departments of dairying, live stock, field husbandry and household science are featured. Reputable varieties of breeding animals for sale or exchange have been carried with the object of improving the herds and flocks. The trains make stops at scheduled points on the lines of railway and is visited by the people of the vicinity, whose problems are dealt with. In Saskatchewan the number of persons reached each season has averaged over 3,000. In Quebec, Alberta and other provinces similar trains have been operated from time to time.

The Dominion and Provincial Departments of Agriculture, in co-operation with the breeders' associations, operated a Better Live Stock Special Train in the Province of Ontario during March and April. The train comprised sixteen cars, including cattle, sheep, swine and poultry. In cattle, the value of the pure bred sire to the beef industry was illustrated, as well as the best type of steers for the British and domestic markets. Typical hogs of different types were carried, also an exhibit of sheep and a display of grades of wool. Addresses on farm topics were given in the lecture car at each stopping place.

Two Livestock Improvement trains were operated during May in the Province of Manitoba under the joint auspices of the Dominion and Provincial Departments of Agriculture and the breeders' associations. The railway companies furnished the trains free of charge. Manitoba-bred bulls of the leading breeds were carried. Every bull was tuberculin tested, and representatives of the breeders accompanied the trains and made the sales. Assistance was extended to purchasers in the form of loan not exceeding one-half of the price of the animal. Bulls were accepted in exchange as part payment. The train was equipped for lectures, motion pictures, demonstrations of types of animals, and other educational features. The lectures included separate programmes for men and women, boys and girls.

In many of the provinces, the Agricultural Instruction Act has been of great assistance to the dairy industry. In Nova Scotia the grant led to the establishment of a division of dairying, and butter factory output was increased from 200,000 pounds in 1912 to over 3,000,000 pounds in 1921.

In Saskatchewan and other western provinces instruction was given in the better breeding and feeding of dairy herds, in the care of milk and cream on the farm, and in the means and methods of marketing. A notable increase has taken place of recent years in the creamery output of those provinces.

In British Columbia cow-testing was featured. In Quebec and in the Maritime Provinces dairy schools were assisted, while the makers of butter and cheese were instructed and assisted through the system of inspection.

The Quebec Department of Agriculture (Bureau of Statistics Branch) has issued a preliminary statement showing the production and value of butter and cheese in that province during 1922, as follows:—Butter, 52,529,344 lbs., valued at $18,110,304; cheese, 39,679,901 lbs., valued at $6,307,581.

The output of the 59 creameries in Saskatchewan was 8,901,104 pounds of creamery butter during the year 1922. That winter dairying is becoming more popular in that province is evidenced by the fact that during November, December and January 1921-22 there were 672,409 pounds of butter manufactured, while during the same months in 1922-23 the creamery output was 1,204,034 pounds, or an increase of 79 per cent.

What milk is doing to build the school children of the nation into strong and healthy citizens, prepared to carry on the arts of peace, will be one of the important subjects discussed at the World's Dairy Congress, which is to be held in the United States next October. President Harding has invited all governments to send official representatives to the meeting and everyone interested in the production, manufacture, distribution and use of milk will be welcome. Many of the world's best known scientists will speak. The proceedings will be conducted in English, French, German and Spanish. Full information may be secured from the World's Dairy Congress Association, 426 Star Building, Washington, D.C., U.S.A.

The 1923 Wool Letter, issued by the Canadian Co-operative Wool Growers, Ltd., states, "The wool statistical position of to-day is strong; stocks are reduced, world consumption is ahead of production, and the demand now covers all grades."

The Hon. Manning Doherty, Minister of Agriculture for Ontario, recently instituted a Horticultural Board whose duty it will be to co-ordinate the work of the horticultural department of the Ontario Agricultural College, the Vineland Station, and the Kemptville and Fort William branches, in order to have their experiments free from overlapping, and their various lines of endeavour directed to some definite end.

The Board consists of the President of the Ontario Agricultural College, the Professor of Horticulture, the Director of the Fruit Branch, the Director of the Vineland Experiment Station, and the Secretary of the Agricultural Department.

The Board will recommend that all students of Horticulture shall in future spend at least one summer of their course at the Fruit Station at Vineland.

One of the weaknesses of our agricultural life is that at the business end of farming there is a lack of co-operation both in production and in marketing. Conditions to-day, however, are greatly improved over what they were ten years ago. This improvement is largely attributable to the aid given by the Agricultural Instruction grant to propaganda work through agricultural societies, producers' conventions, agricultural representatives, and similar means. In two of the provinces, Ontario and Saskatchewan, the grant led to the creation of a Branch to give information on co-operative organizations and the extension of markets. In other provinces educational effort has been applied to the marketing of live stock, poultry and eggs, wool, etc. Demonstrations in the marketing of wool were so successful as to lead to the adoption of this method by the Canadian Co-operative Wool Growers, an organization of producers operating throughout the Dominion.

With the object of providing an authentic and regular source of market information for the farmers in Ontario, the Provincial Minister of Agriculture, the Hon. Manning Doherty, announces that arrangements have been made whereby a cable letter is being received twice weekly from England and given to the press for publication. The letter quotes prevailing prices for such products as cheese, butter, bacon, condensed milk, tobacco, fruits, fresh and canned, cattle and eggs. In addition to prices, the general market conditions and outlook in Great Britain are set forth.

The special courses in Dairying, held at the Ontario Agricultural College in March, were attended by 123 students.

The outstanding feature in connection with the courses was the large demand for men to go into factories, city milk plants, and the Civil Service as graders. One of the Western Provinces asked for 45 men to act as cream graders. This indicates the strong position grading holds among Western Canada creamerymen.

The registration in the various courses was as follows:—Factory Class, 42; Farm Dairy, 7; Cow-testing, 12; Ice-cream and Soft Cheese, 16; Butter and Cheesemakers, 38; Specialists, 8.

G. H. Cutler, Professor of Field Husbandry of the University of Alberta, was recently elected a Fellow of the Royal Meteorological Society of London, England. Professor Cutler has been engaged in Agronomic research in the West for the past ten years, and has for several years, been accumulating and compiling data regarding temperature and moisture conditions throughout the

Province of Alberta. This information will be of especial value in connection with land settlement, irrigation, and drought relief schemes. It is in recognition of these and other contributions to the science of meteorology that the Society has conferred this honour.

The establishment of a system of Agricultural Representatives in local centres is looked upon as one of the very important steps that has been taken of recent years to render effective service to the farmer. The passing of the Agricultural Instruction Act gave a marked impetus to the development of this service, and although retarded by the war, the system has been extended to all the provinces in some form or other, while the older provinces are now completely organized. A considerable portion of the grant has been applied to the extension and development of this service.

Since the establishment of the county agriculturist service in the Province of Quebec, the work has grown very rapidly, until it has become impossible to properly direct it from one central head office. It has therefore been decided to divide the province into six large agricultural districts, with at the head of each a District Superintendent to supervise the work of the county agriculturists within his territory. With his comparatively small number of counties to visit he will be able to keep closely in touch with the work of each county agriculturist.

To the district superintendent's office will be attached the assistant agriculturists for the district, instead of their being attached to certain counties as at present. These assistants will be sent out to the various agriculturists as they are required. The superintendent will also have under his control a certain number of demonstrators or instructors on specialized lines of work, placed in the district by the various branches of the Department. These men will be partly responsible to the superintendent, who directs their field work, and partly responsible to the chiefs of the branches that they represent.

The School Fair and Boys' and Girls' clubs are efforts to interest boys and girls in better seed, better stock, and better methods of agricultural and housekeeping practice. They give boys and girls a new point of view as regards farming operations, and have grown in response to popular demand. The fact that they retain their hold from year to year upon both young and old is an indication of their usefulness and value.

The Boys' and Girls' Club movement in Manitoba began concurrently with the agricultural instruction grant being made available in 1914. Its development has been noteworthy, there now being 225 central clubs, 1,600 branches and over 30,000 members. During the past year 215 club fairs were held at which over 30,000 children exhibited.

The boys' and girls' demonstration team movement began in Manitoba four years ago, and was participated in last year by over 1,000 girls. The range of subjects dealt with by the teams is a wide one, including canning, dyeing, laundering, bread-making, millinery, cooking, and many others.

Previous to the time that the Agricultural Instruction Act went into effect there were only 25 school fairs in the Province of Ontario. In 1921, 442 such fairs were held in which a total of about 100,000 boys and girls participated.

In Saskatchewan, the Farm Boys' Camp, inaugurated in 1915, has proved a very successful method of being of service to farm boys, 2,500 having already been reached.

Last year, in the same Province, 62 centres organized boys' and girls' clubs, and 275 school fairs were held.

APPOINTMENTS AND STAFF CHANGES

Dr. J. M. Swaine has been appointed Associate Dominion Entomologist in place of Chief, Division of Forest Insects, and will assist the Dominion Entomologist in the general work of the Branch, particularly that pertaining to research.

Mr. Ronnie Cassels, B.S.A., has been appointed Assistant superintendent at the Dominion Experimental Tobacco Station, Farnham, Que., in the place of Mr. Armand Gelinas, resigned.

Mr. P. Stewart, B.S.A., has been elected by the executive of the Canadian Seed Growers' Association to replace Mr. L. H. Newman, who was, on February 1 of this year, promoted to the position of Dominion

Cerealist. Mr. Stewart, who was born at Wick, Scotland, came to Canada at an early age. He was prominent in the development, in its early stages, of the seed growing industry of the Rainy River district in Ontario, and experience and organizing ability are among the qualifications that fit him for the position he now occupies. On his return from overseas military service, he was appointed to a position on the staff of the Soldier Settlement Board, after which he was engaged in inspection work in connection with the Seed Branch of the Dominion Department of Agriculture. The appointment is for the balance of the Association's year.

The following persons have been appointed Dairy Produce Graders at Montreal, P.Q.: Jas. H. Henderson, formerly Dairy Promoter, Toronto; John Cuthberton, Stratford, Ont.; Geo. Thimens, Sussex, N.B.; Freeman Brown, Oxford Mills, Ont.; Frank Monahan, Valleyfield, Que.; G. A. Bourbeau, St. Hyacinthe, Que.; E. Charbonneau, St. Hyacinthe, Que.; Jas. L. Irwin, Kingston, Ont.; (for Central Ont).

ASSOCIATIONS AND SOCIETIES

Alberta Poultry Association.—President, J. H. Westbrook, Lethbridge; 1st Vice-president, Jos. Shackleton, Edmonton; 2nd Vice-president, W. A. Moore, Medicine Hat; Secretary-Treasurer, P. J. Timms, Calgary.

New Brunswick Sheep Breeders' Association.—President, W. E. Wallace; Vice-president, W. K. Allen; Secretary-Treasurer, Jas. Bremner.

Nova Scotia Fruit Growers' Association.—President, J. Elliott Smith, Wolfville; Vice-president, A. Fitzrandolph, Bridgetown; Secretary, F. W. Foster, Kingston.

Niagara Peninsula Fruit Growers' Association.—President, J. B. Fairbairn, Beamsville; Secretary-Treasurer, Carl E. Fisher, St. Catharines.

Quebec Jersey Cattle Breeders' Association.—President, F. G. Gale, Waterville; Vice-president, Chas. O. Edwards, Hillhurst; Secretary-Treasurer, R. L. Gale, Waterville.

British Columbia Goat Breeders' Association.—President, D. Mowat, McKay; Vice-president, C. H. Unwin, Victoria; Secretary-Treasurer, George Pilmer, Department of Agriculture, Victoria.

New Brunswick Farmers' and Dairymen's Association.—President, C. E. Pickett, Andover; Vice-president, H. W. Atkinson, Fredericton Jct.; Corresponding Secretary, A. J. Doucet, Notre Dame, Recording Secretary, A. J. Gaudet, St. Joseph, Westmoreland.

Canadian Standard Bred Horse Society.—Hon. President, F. S. Scott, Galt, Ont.; President, Thomas Bartram, 78 Roxborough W., Toronto; Vice-president, J. J. Burns, 393 Berkley St., Toronto; Secretary-Treasurer, Jno. W. Brant, 66 Queen St., Ottawa.

United Farmers of Alberta.—President H. W. Wood, Carstairs; Vice-president, H. E. G. H. Scholefield, Crossfield; Secretary-Treasurer, H. Higginbotham, Calgary.

Saskatchewan Grain Growers' Association.—President, J. A. Maharg; Vice-president, Geo. F. Edwards; Secretary, A. J. McPhail, Farmers Bldg., Regina, Sask.

Women's Section, Saskatchewan Grain Growers' Association.—President. Mrs. W. H. Frith, Birmingham; Vice-president, Mrs. Ida McNeal, Expanse; Secretary, Mrs. M. L. Burbank (Central Office) Regina.

British Columbia Poultrymen's Co-operative Exchange.—President, H. Ruttledge, Sardis; Vice-president, C. Raine, Surrey Centre; Secretary-Treasurer, G. C. Milnes, 1114 Hamilton St., Vancouver.

Saskatchewan Belgian Horse Breeders' Club.—President, Robert Thomas, Grandora; Vice-president, D. V. Runkle, Regina; Secretary, E. L. Hodgens, Halbrite.

Saskatchewan Percheron Breeders' Club.—President, W. B. Thompson, Milestone; Vice-president, A. McLaren, Pense; Secretary-Treasurer, L. A. Paul, Regina.

Saskatchewan Clydesdale Breeders' Club.—President, P. H. Taylor, Arcola; Vice-president, Jack Byers, Valjean; Secretary, N. D. MacKenzie, Indian Head.

Saskatchewan Hereford Breeders' Club.—W. N. Catley, Craven; Vice-president, W. S. Shore, Cupar.

Saskatchewan Shorthorn Breeders' Club.—President, R. A. Wright, Drinkwater; Vice-president, N. D. MacKenzie, Indian Head; Secretary, N. M. Ross, Indian Head.

Alberta Seed Growers' Association.—President, Major H. G. L. Strange, Fenn; Vice-president, G. M. Stewart, Dominion

Seed Branch, Calgary, Secretary-Treasurer, W. J. Stephen, Crops Commissioner, Edmonton, Alta.

Alberta Agricultural Fairs' Association.—President, Hulse Cates, Oyen; Vice-president, Harold Huxley, Lloydminster; Secretary-Treasurer, Alex. Galbraith, Edmonton.

Saskatchewan Agricultural Societies' Association.—President, N. B. Williams, Aberarthy; Secretary-Treasurer, L. M. Moore, Colgate.

Manitoba Beekeepers' Association.—President, G. M. Newton; Vice-president, W. G. Standridge; Secretary-Treasurer, F. J. Lloyd, Provincial Apiarist, Parliament Buildings, Winnipeg.

Nova Scotia Farmers' Association.—President, Rev. R. L. MacDonald, St. Peters; 1st Vice-president, A. Fitzrandolph, Bridgetown; 2nd Vice-president, P. H. Andrews, Cardeath; Secretary-Treasurer, C. R. B. Bryan, Agricultural College, Truro.

Ontario Vegetable Growers' Association.—President, W. H. Stewart, Aylmer, Que.; Vice-presidents, W. J. Cooke, Cataraqui, and Chris. Fretz, Vineland Station; Secretary-Treasurer, J. Lockie Wilson, Toronto.

Canadian Holstein Breeders' Association.—President, R. W. E. Burnaby, Jefferson; Vice-presidents, R. M. Holtby, Port Perry; Hon. W. M. Lea, Charlottetown, P.E.I.; P. J. Salley, Lachine Rapids; Cris. T. Houck, Chippawa.

Ontario Plowmens' Association.—President, George B. Little, Agincourt; 1st Vice-president, W. H. Patterson, Agincourt; 2nd Vice-president, R. H. Abraham, Chatham; Secretary, J. Lockie Wilson, Toronto.

Saskatchewan Field Husbandry Association.—Honorary President, Dean W. J. Rutherford, College of Agriculture, Saskatoon; President, L. G. Booth, Director of Co-operative Experiments, University of Saskatchewan, Saskatoon; 1st Vice-president, W. J. F. Warren, M.L.A., Bellbeck; Secretary, Maurice Champdin, Professor of Field Husbandry, University of Saskatchewan, Saskatoon.

Manitoba Clydesdale Breeders' Club.—President, James Bowsett, Napinka; Vice-president, Freeman Rice, Binscarth.

Manitoba Shorthorn Breeders' Club.—President, E. McConnell, Hamiota; Vice-president, Freeman Rice, Binscarth; Secretary, John Strachan, Pope.

Manitoba Hereford Breeders' Club.—President, J. A. Chapman, Hayfield; Vice-president, Frank Hyslop, Treherne; Secretary, R. W. Rutherford, Teulon.

Dominion Shorthorn Breeders' Association.—President, Harry Pettit, Freeman; Vice-president, Hon. Duncan Marshall; Second Vice-president, J. Gardhouse, Weston; Secretary-Treasurer, G. E. Day, Guelph.

Canadian Hackney Breeders' Society.—Honorary President, Robert Graham, Toronto; President, Dr. W. J. R. Fowler, Guelph; Vice-president, H. A. Mason, Scarboro'; Secretary-Treasurer, J. E. Rettie, Toronto.

British Columbia Ayrshire Breeders' Association.—President, E. A. Wells, Sardis, B.C.; Vice-president, S. Shannon, Cloverdale, B.C.; Secretary-Treasurer, H. M. King, University of British Columbia, Vancouver.

British Columbia Stockbreeders' Association.—President, Alex. Davie, Ladner; Vice-president, F. B. Ward, Douglas Lake.

Canadian Swine Breeders' Association.—President, J. E. Brethour, Burford; Vice-president, Wm. Gilbert, Stony Plain, Alta.; Secretary-Treasurer, J. E. Rettie, Parliament Buildings, Toronto.

Ontario Swine Breeders' Association.—President, W. F. Wright, Glanworth; Vice-president, Russell Templar, Burford; Secretary-Treasurer, J. E. Rettie, Toronto.

Ontario Sheep Breeders' Association.—President, Jas. Bowman, Guelph; Vice-president, C. Stobbs, Wheatley; Secretary-Treasurer, L. O'Neil.

Canadian Dual-Purpose Shorthorn Breeders' Club.—President, G. L. Smith, Meadowvale; Vice-president, D. Z. Gibson, Caledonia; Secretary-Treasurer, Ross Martindale, Caledonia.

Ontario Cattle Breeders' Association.—President, John Gardhouse, Weston; Vice-president, W. E. Thompson, Woodstock; Secretary, R. W. Wade, Toronto.

Ontario Seed Growers' Association.—President, J. W. Sangster, Listowel; Vice-president, A. G. Gormley, Unionville; Secretary-Treasurer, F. C. Hart, Toronto.

Western Ontario Poultry Association.—President, T. Simpson; 1st Vice-president, R. Oke, London; 2nd Vice-president, W. J. Roberts, Secretary-Treasurer, J. E. Rettie, Parliament Buildings, Toronto.

Canadian Jersey Cattle Club.—President, F. E. M. Robinson, Richmond, Que.; 1st Vice-president, Frank Silcox, Iona; 2nd Vice-president, J. M. Dolson, Brampton; Secretary-Treasurer, J. W. Wheaton, 186 King Street, W., Toronto.

Quebec Jersey Breeders' Association.—Hon. President, J. W. Norcross, Montreal; President, F. G. Gale, Grayburn Farms, Waterville; Vice-president, C. O. Edwards, Maplehurst Farm, Hillhurst, Que.; Secretary-Treasurer, R. L. Gale, Waterville.

Saskatchewan Corn Growers' Association.—Hon. President, W. R. Abbott, Maple Creek; President, David Kearns, Maple Creek; 1st Vice-president, C. R. Evans, Piapot; 2nd Vice-president, Jack Byers, Valjean; Secretary-Treasurer, C. H. Stockdale, Maple Creek.

Farmer's Union of Canada.—Directors: H. K. Webb, Kelvington; J. Shore, Lintlaw; S. Sinclair, Lipton; Secretary-Treasurer, N. H. Schwarz, Ituna.

Canadian Horticultural Council.—President, Col. H. L. Roberts, Grimsby; 1st Vice-president, F. W. Bishop, Paradise, N.S.; 2nd Vice-president, L. E. Taylor, Kelowna, B.C.; Secretary-Treasurer, L. F. Burrows, Ottawa.

Alberta Horse Breeders' Association.—Secretary, E. L. Richardson, Calgary, Alta.

Canadian Aberdeen-Angus Breeders' Association.—President, James Browne, Neudorf, Sask.; Vice-president, John Lowe, Elora, Ont.

British Columbia Honey Producers' Association.—Secretary-Treasurer, Central Executive, W. J. Sheppard, Nelson, B.C.

New Brunswick Beekeepers' Association.—President, Geo. L. Pugh, Nashwaaksis, N.B.; 1st Vice-president, C. W. Lewis, Perth, N.B.; 2nd Vice-president, C. Allen Coster, Hampton; Secretary-Treasurer, H. G. Miller, Provincial Apiarist, Fredericton.

Canadian Pony Society.—President, Dr. W. J. R. Fowler, Guelph; Vice-president, A. E. Major, Whitevale; Secretary-Treasurer, G. de W. Green, Toronto.

Canadian Shire Horse Association.—President, W. J. Gardhouse, Thistletown; Vice-president, Thos. Rawlinson, Innisfail, Alta.; Secretary-Treasurer, G. de W. Green, Toronto.

The Society at its annual meeting passed a resolution recording appreciation of the gift to the Dominion of Canada by the English Shire Horse Society of two stallions and three mares representative of the breed.

Ontario Horticultural Association.—President, J. P. Jaffray, Galt; 1st Vice-president, J. E. Carter, Guelph; 2nd Vice-president, Geo. Simpson, Ottawa; Secretary, J. Lockie Wilson, Toronto; Treasurer, C. A. Hesson, St. Catharines.

Canadian Hereford Breeders' Association.—President, Walter Redhead, Milton, Ont.; Vice-president, J. A. Chapman, Hayfield, Man.; Secretary-Treasurer, H. D. Smith, Ancaster, Ont.

Ontario Hereford Breeders' Association.—President, J. E. Harris, Kingsville; Vice-president, Wm. Mitchell, Norham; Secretary-Treasurer, A. L. Currah, Bright.

Ontario Yorkshire Breeders' Society.—President, H. A. Dorrance, Orangeville; Vice-president, D. J. Lerch, Preston; Secretary-Treasurer, J. E. Rettie, Parliament Buildings, Toronto.

Ontario Berkshire Breeders' Society.—President, G. A. Dewar, Wyoming; Vice-president, G. L. Smith, Meadowvale; Secretary-Treasurer, J. E. Rettie, Parliament Buildings, Toronto.

Brown Swiss Breeders' Association.—Hon. President, J. B. Spencer, Ottawa; President, W. A. Jolley, Waterloo, Que.; Vice-president, W. T. Sass, Kitchener; Secretary, R. H. Libby, Stanstead, Que.

Tamworth Breeders' Club.—President, H. German, St. George; Vice-president, G. Douglas, Mitchell; Secretary, J. Alexander, Georgetown.

Canadian Ayrshire Breeders' Association.—Hon. President, H. S. Arkell, Ottawa; President, J. L. Stansell, M.P., Strafford-ville, Ont.; Vice-president, Frank Byrne, Charlesbourg, Que.; Secretary, W. F. Stephen Huntingdon, Que.

Among the resolutions passed was one endorsing the proposal to establish Union Stock Yards at Montreal.

Nova Scotia Dairymen's Association.—President, John E. Falt, Antigonish; Vice-president, C. R. DeLong, New German; Secretary-Treasurer, W. A. MacKay, Truro.

Nova Scotia Poultry Association.—President, H. H. Hull, Glace Bay; Vice-president, Frank E. Jackson, North Sydney; Secretary-Treasurer, J. P. Landry, Truro.

Ontario Angus Breeders' Association.—President, J. Lowe; Secretary, Jas. Bowman, Guelph.

Ontario Milk Producers' Association.—President, E. H. Stonehouse; Vice-president, E. A. Orr; Secretary, J. P. Griffin.

Saskatchewan Live Stock Board.—President, R. A. Wright, Drinkwater; Vice-president, Robt. Sinton, Regina; Secretary, J. G. Robertson, Regina.

The presidents and vice-presidents of the undermentioned Live Stock Associations constitute the personnel of the Board, together with representatives of the Department of Agriculture and the College of Agriculture.

Horse Breeders' Association.—President, Robt. Thomas, Grandora; Vice-president, Swanton Haggerty, Regina.

Cattle Breeders' Association.—President, R. A. Wright, Drinkwater; Vice-president, W. D. Lyon, Deveron.

Sheep Breeders' Association.—President, [illegible]; Vice-president, [illegible]

Swine Breeders' Association.—President, C. M. Learmonth, Regina; Vice-president, [illegible]

Poultry Breeders' Association.—President, W. H. Hoyle, Regina; Vice-president, S. L. Smith, Strathcona.

Saskatchewan Stock Growers' Association.—President, J. Ryan, Valjean; Vice-president, [illegible]

National Dairy Council of Canada.—President, E. H. Stonehouse, Toronto; Vice-president, F. M. Logan; Secretary, D'Arcy Scott, Central Chambers, Ottawa.

Among the resolutions passed at the annual meeting was a pronouncement in favour of the compulsory pasteurization of all milk for consumption in cities.

In order to improve the quality of Canadian cheese, it was recommended that it be made illegal to remove cheese from the place of manufacture until after the lapse of 14 days.

THE LIBRARY

LIST OF PRINCIPAL ACCESSIONS TO THE DEPARTMENTAL LIBRARY, INTERNATIONAL INSTITUTE BRANCH, DEPARTMENT OF AGRICULTURE.

The miller on the mill, by James [illegible] Liverpool, Northern publishing co. 1920. 216p. il.

Researches on fungi, Vol. II: Further investigations upon the production and dissection of spores in Hymenomycetes, by A. H. R. Buller. New York, Longmans, Green & co. 1922. 492p. il.

Outlines of evolutionary biology, by Arthur Dendy. London, Constable & co. ltd. 1921. 354p. il.

The origin and development of the Composite, by James Small. London, William Wesley & son, 1919. 384p. il.

Forced movements, tropisms, and animal conduct, by Jacques Loeb. Philadelphia, J. B. Lippincott co. 1918. 209p. il.

Handbook of mineralogy; a manual for [illegible], by Jacques W. Barrett. New York, John Wiley & [illegible] 1921. 204p. il.

The [illegible] of Italy; their [illegible]. Milan, "Credito Italiano." 1922. 3 volumes.

Letters of William Farrer, [illegible] breeder, to [illegible] Australia, 1894-1906, to Dr. B. T. Galloway and Mr. M. A. Carleton. Washington, Bureau of plant industry, 1922. 110p. typw.

Répertoire des [illegible] pour aider à la détermination des [illegible] des Vosges, des feuillages et des fruits. Paris, Société [illegible] 182 p. [illegible]

Tobacco, a book about tobacco; its history, [illegible] cultivation, [illegible] and hygiene influencing commercial development, industrial processes and governmental regulation, by [illegible] A. Wynter. New York, The tobacco leaf publishing co., n.d. 318p. il.

Mexican petroleum... New York, Pan American petroleum & transport co. 1922. 300p. il.

Practical color photography, by E. J. Wall. Boston, American photographic publishing co. 1922. 248p. il.

Origin and history of all pharmacopeial vegetable drugs... by J. U. Lloyd. Cincinnati, 1921. 449p.

A monograph of azaleas... by E. H. Wilson and Alfred Rehder. Cambridge University press, 1921. 219p.

Veterinary studies for agricultural students, by M. H. Reynolds. 8th ed. New York, Macmillan co. 1922. 301p. il.

Hardy perennials, by A. J. Macself. New York, Charles Scribner's sons, 1922. 219p. il.

Woollen and worsted spinning, by A. F. Barker. Toronto, Cassell & co. 1922. 344p. il.

A biochemic basis for the study of problems of taxonomy, heredity, evolution, etc., with especial reference to the starches and tissues of parent-stocks and hybrid-stocks and the starches and hemoglobins of varieties, species and genera, by E. T. Reichert. Washington, Carnegie institution, 1919. 2 parts.

Plants of the Punjab; a descriptive key to the flora of the Punjab, North-west frontier province and Kashmir, by C. J. Bamber. Lahore, Government printer, 1916. 652p. il.

Fruit growing in New Zealand, by J. T. Sinclair. London, Whitcombe & Tombs, ltd. n.d. 132p. il.

The anomalies of [illegible], by The Svedberg. New York, D. Van Nostrand co. 1921. 127p. il.

Rose gardening, by Mary Hampden. New York, Charles Scribner's sons, 1922. 231p. il.

Electricity in agriculture, by A. H. Allen. Toronto, Sir Isaac Pitman & sons, 1922. 117p. il.

Bulb gardening, by Mary Hampden. New York, Charles Scribner's sons, 1922. 221p. il.

The industrial Punjab, by A. Latifi. New York, Longmans, Green & co. 1911. 304p.

The petroleum industry, London. The institution of petroleum technologists, 1922. 346p. il.

Human life as the biologist sees it, by Vernon Kellogg. New York, Henry Holt & co. 1922. 140p.

The reptiles of Western North America, by John Van Denburgh. San Francisco, 1922. 2 volumes.

Rural Michigan, by L. A. Chase. Toronto, The Macmillan co. 1922. 492 p. il.

History of the board of trade of Chicago, edited by C. H. Taylor. Chicago, Robert O. Law Co. 1917. 3 volumes.

Tsetse-flies; their characteristics, distribution and bionomics with some account of possible methods for their control, by Major E. E. Austen, and Emile Hegh. London, The imperial bureau of entomology, 1922. 188p. il.

Australia: A commercial and industrial handbook, by A. W. Ferrin. Washington, Government printing office, 1922. 162p. il.

Bread facts, 4th ed. New York, Ward baking co. Research products department. 1922. 127p.

Studies in plant respiration and photosynthesis, by H. A. Spoehr and J. M. McGee. Washington, Carnegie institution of Washington, 1923. 98p.

Contributions to embryology. Washington, Carnegie institution, 1922. 162p. il. plates

Enseignement agricole; lois, décrets, arrêtes, circulaires et instructions. Paris, Imprimerie nationale, 1921. 246p.

Ontario, Agricultural development board. Report vol. 1, 1922. 10p. mimeo.

Etude sur les champignons parasites, par G. Arnaud. Paris, Librairie agricole de l'institut national agronomique, 1921, 115p il. plates.

The agricultural credits act of 1923. Washington, Government printer, 1923. 32p.

Législation relative au crédit mutuel et à la coopération agricoles. Paris, 1922. 77p.

Studies in the physiology of the fungi. St. Louis, Washington university. 10 pamphlets.

Meat production, consumption, and foreign trade in United States, 1907-1922, comp. by John Roberts. Washington, Government printer, 1922. 9p. mimeo.

The marvel of irrigation, by R. L. Adams and W. W. Bedford. San Francisco. 1921. 71p.

Dominion of Newfoundland and Labrador; some information about the resources of the ancient colony. London, High commissioner for Newfoundland, 1921. 155p. il. maps.

The pleistocene of North America and its vertebrated animals from the States east of the Mississippi river and from the Canadian provinces east of longitude 95, by O. P. Hay. Washington, Carnegie institution, 1923. 499p. il.

Enquête sur le travail agricole. Bruxelles, Vromant & co. 1920. 880p.

Venezuela; an economic report presented by students of the school of foreign service as an aid to the foreign trade of United States. Washington, Published by the university, 1921. 166p.

History of Aberdeen-Angus cattle in Great Britain and America. Chicago, American Aberdeen-Angus breeders' association, 1922. 40p.

Report of the commission appointed to inquire into the operation of "The rural credits act." Winnipeg, 1923. 22p.

Le bon vigneron; art de cultiver la vigne, de faire le vin et d'obtenir des raisins de table, par G. Couanon. Paris, Librairie agricole de la maison rustique, n.d. 160p.

The Salton Sea; a study of the geography, the geology, the floristics, and the ecology of a desert basin, by D. T. MacDougal. Washington, Carnegie institution, 1914. 182p. il.

Inter-departmental committee on the laws, regulations and procedure governing the sale of milk in Scotland. Report. Edinburgh, H.M.S. Office, 1922. 127p.

Report of the committee on agricultural credit. London, H.M.S. Office, 1923. 39p.

Laboratory manual for farm gas engines, by F. W. Duffee. Madison, Dept. of agricultural engineering, University of Wisconsin. 58 p.

Report on the fixation and utilization of nitrogen. Washington, Government printing office, 1922. 353p. il.

Comparison of tariff acts. Washington, Government printer, 1922. 379p.

Report on the statistical work of the U.S. Government. Washington, Government printer, 1922. 405p.

Report of the commissioner on banking and credit with respect to the industry of agriculture in the province of Alberta. Edmonton, 1922. 49p. mimeo.

Guide pratique pour la tenue de la comptabilite d'une caisse locale de credit agricole mutuel. Paris, Imprimerie nationale, 1919. 55p.

Our better relations with our Latin American neighbors; a journey in South America, by Robert Bacon. Washington, Carnegie endowment for international peace, 1916. 238p.

The grapes of New York, by U. P. Hedrick. Albany, N.Y. Dept. of agriculture. 1921. 638p. il.

Manuel pratique de culture fruitière, par MM. Denaiffe & Cie. Paris, Librairie J. B. Baillière et fils. 1920. 402p. il.

Intelligence tests and school reorganization, by L. M. Terman & others. Yonkers-on-Hudson, World Book co. 1922. 114p.

Models of research in genetics, by R. Pearl. Toronto, Macmillan, 1915. 182p.

The Canada bird, by F. H. Bohrer. Utica, N.Y., The author. 1922. 88p.

Pronunciation of plant names. New York, Garden club of America. 1922. 94p.

Rural credits system for the United States, by Herbert Myrick. New York, Orange Judd co. 1922. 239p.

Rural credit and agriculture, by Ivan Wright. New York, McGraw-Hill book co. 1922. 440p.

La taille Lorette, par M. Louis Lorette. Versailles, 1921. 230p. il.

The mutation theory, by Hugo de Vries. Chicago, The Open Court publishing co. 1910. 2 volumes.

Market milk, by Ernest Kelly and C. E. Clement. New York, John Wiley & sons, 1923. 445p. il.

Color standards and color nomenclature, by R. Ridgeway. Washington, The author, 1912. 53 colored plates.

Farm horticulture, by G. W. Hood. New York, Lea & Febiger, 1921. 354p.

The feeding of animals, by W. H. Jordan. Toronto, Macmillan, 1917. 473p. il.

The modern farm cooperative movement, by C. C. Sherlock. Des Moines, Iowa, 1922. 377p.

Home tanning and leather making guide, by A. B. Farnham. Columbus, O., A. R. Harding, 1922. 176p. il.

Age and area; a study in geographical distribution and origin of species, by Dr. J. C. Willis. Toronto, Cambridge university press, 1922. 259p.

The continental system, by E. F. Heckscher. Washington, Carnegie endowment for international peace, 1922. 420p.

An introduction to vegetable physiology, by J. R. Green. London, J. & A. Churchill, 1911. 470p. il.

Standard methods for the bacteriological examination of milk. Boston, American public health association, 1921. 24p.

The Southdown sheep, by E. Walford-Lloyd. Chichester, Eng., I. G. Willis, 1922. 48p. il.

Urban land economics, by R. T. Ely and others. Ann Arbor, Mich., Edwards bros. 1922. 145p. mimeo.

Beautiful flowering shrubs, by G. C. Nuttall. Toronto, Cassell & co. 280p. il.

NEW PUBLICATIONS

DOMINION DEPARTMENT OF AGRICULTURE

Report of the Agricultural Instruction Act, 1921-22.

Animal Husbandry Division.—Interim Report of the Dominion Animal Husbandman, C. B. Rothwell, B.S.A., for the year ending March 31, 1922. Dominion Experimental Farms.

Poultry.—By Geo. Robertson, Assistant Dominion Poultry Husbandman and W. W. Lee, Poultry Husbandman, Poultry Division. Bulletin No. 18—New series. Dominion Experimental Farms.

Mutton Chops.—By S. J. Charnon, B.A., B.S., Assistant to Dominion Animal Husbandman and Jos. Maufbey, Dairyman, Experimental Farms Branch. Pamphlet No. 27—New series.

Weeds of Plant Life.—By W. A. Ross, Entomological Laboratory, Vineland Station, Ont. Pamphlet No. 31—New Series. Entomological Branch.

Manitoba Approved Flocks.—By A. C. McCulloch, B.S.A., Live Stock Branch, Poultry Division. Pamphlet No. 25—New Series.

The Hessian-Fly in the Prairie Provinces.—By Norman Criddle, Entomologist in charge for Manitoba. Pamphlet No. 30—New Series, Entomological Branch.

In the Trough of the Wave.—By W. D. Albright, Superintendent, Experimental Substation, Beaverlodge, Alta. Pamphlet No. 26—New Series. Experimental Farms Branch.

Experimental Farm, Brandon, Man., 1922.—Report of the Superintendent, W. C. McKillican, B.S.A. Dominion Experimental Farms.

The Dairy Produce Act and Regulations.—Administered by the Dairy and Cold Storage Branch. Acts, Orders and Regulations No. 6

ONTARIO

Report of the Minister of Agriculture for the Province of Ontario.—Year ending October 31, 1920.

Ontario Agricultural College and Experimental Farm, 1921.—Forty-seventh Annual Report.

Entomological Society of Ontario, 1921.—Fifty-second Annual Report.

Fruit Growers' Association of Ontario, 1921.—Fifty-third Annual Report.

Beekeepers' Association of Ontario, 1921.—Forty-second Annual Report.

Live Stock Branch, 1921.—Annual Report.

Feeding Young Live Stock.—By L. Stevenson B.S.A., M.S., Secretary and Supervising Director, Department of Agriculture.

Grafting Fruit Trees.—By Jas. A. Neilson, B.S.A., M.S. Ontario Agricultural College. Bulletin No. 294.

The European Corn Borer in Ontario.—By G. J. Spencer, Department of Entomology, Ontario Agricultural College, Guelph, and H. G. Crawford, Entomological Branch, Dominion Department of Agriculture, Ottawa. Bulletin No. 295.

QUEBEC

Report of the Minister of Agriculture for the Province of Quebec, 1921-22.

MANITOBA

Financing the Home.—By Mrs. Lottie J. Duncan, Lecturer in Household Management, Manitoba Agricultural College, Extension Bulletin No. 57.

Hatching, Brooding, Rearing and Feeding Chicks.—By M. C. Herner, B.S.A., Professor of Poultry Husbandry, Manitoba Agricultural College. Extension Bulletin No. 35—Third edition.

Color and Design in Relation to Dress.—By Mrs. Jean South, Lecturer in Household Art, Manitoba Agricultural College. Extension Bulletin No. 58.

Hand Selection and Harvesting of the Seed Plot.—By W. T. G. Wiener, B.S.A., Department of Field Husbandry, Manitoba Agricultural College. Extension Bulletin No. 49. Superseding Extension Bulletin No. 5.

Management of the Brood Mare and Foal.—By C. D. McGilvray, M.D.V., Lecturer in Veterinary Science, Manitoba Agricultural College. Extension Bulletin No. 11—Second Edition.

Poultry Diseases.—By M. C. Herner, B.S.A., Professor of Poultry Husbandry, Manitoba Agricultural College. Extension Bulletin No. 32—Second Edition.

Lessons on Weeds.—By V. W. Jackson, Professor of Botany, Manitoba Agricultural College. Extension Bulletin No. 30—Third Edition.

Poultry Houses for Farm and Town.—By M. C. Herner, B.S.A., Professor of Poultry Husbandry, and R. Mitchell, Agricultural Engineering Department, Manitoba Agricultural College. Extension Bulletin No. 15.—Third Edition.

Common Diseases and Disorders of the Foal.—(Sequel to Extension Bulletin No. 11, "Management of the Brood Mare and Foal"). By C. D. McGilvray, M.D.V., Lecturer in Veterinary Science, Manitoba Agricultural College, Extension Bulletin No. 13—Second Edition.

Canning by the Cold Pack Method.—Revised from former editions by Miss Mary C. Hiltz, B.S., Professor of Household Science, and C. H. Lee, M.A., Professor of Bacteriology, Manitoba Agricultural College. Extension Bulletin No. 12.—Fifth Edition.

Cheese-Making on the Farm.—By I. Villeneuve, Instructor in Cheese Making, Dairy Branch, Department of Agriculture and Immigration, Winnipeg. Extension Bulletin No. 20.—Second Edition.

Agricultural Society Activities.—By S. T. Newton, Director, Agricultural Extension Service, Department of Agriculture, Winnipeg. Extension Bulletin No. 36.

SASKATCHEWAN

Summer Fallow Substitutes for Saskatchewan.—By Manley Champlin, Professor of Field Husbandry, College of Agriculture, University of Saskatchewan. Agricultural Extension Bulletin No. 16.

ALBERTA

Roughages for Wintering Pregnant Ewes.—By A. A. Dowell and J. E. Bowstead, Department of Animal Husbandry, College of Agriculture, University of Alberta.—Bulletin No. 1.

NEW BRUNSWICK

Annual Report of the Department of Agriculture for the year ended October 31, 1922.

MISCELLANEOUS

Federal Aid to Agriculture by the Parliament of Canada under the Agricultural Instruction Act of 1913.—Published by the Canadian Education Association.

Planting and Care of Roadside Trees.—Appendix to the annual report of the Department of Public Highways. Publication No. 34.

Canadian National Live Stock Records.—Report of Record Committee to Record Board and Record Associations for the year 1922.

Canadian Swine Breeders Record.—Volume 33. Compiled and edited in the office of the Canadian National Live Stock Records, Ottawa.

PART V

The International Institute of Agriculture

FOREIGN AGRICULTURAL INTELLIGENCE

All communications in regard to this section should be addressed to T. K. Doherty, International Institute Commissioner, Department of Agriculture, West Block, Ottawa.

SCIENCE AND PRACTICE OF AGRICULTURE

GENERAL INFORMATION

[illegible]. The Standardization of Field Experiments. Wilson, J. T., Army, A. C., Salmon, S. C. (Committee on Standardization of Field Experiments), in *Journal of the American Society of Agronomy*, Vol. XIII, No. 9, pp. 368-374. Bibliography. Lancaster, Pa., January [illegible], 1921.

The Committee appointed by the American Society of Agronomy for standardizing the methods of conducting field experiments has for many years been making a careful study of the question. Information concerning the practice of the majority of the Experiment Station workers in the United States has been collected. With the data at hand, the Committee now feels that the Society of Agronomy should begin to define and adopt certain standards for locating, laying out and conducting the ordinary kinds of field experiments.

The great variety of conditions under which field experimental work must be done makes it impossible in certain respects to lay down any but very general rules. Some guiding principles can, however be fixed in order to make such work more uniform and the results more accurate. The chief points in the author's paper may be summarized as follows:

Recommended Standards for Field Plot Experiments in Soil Fertility.—In each locality, one type only of soil should be represented in any one experiment; it is therefore necessary before beginning the experiment to ascertain the uniform character of the piece of land chosen; topographically, it should be reasonably level and slope in one direction only; otherwise special precautions must be taken to prevent soil washing. Where artificial drainage is required the drains should be so arranged as to influence all parts alike. Where irrigation is practised, provision should be made to water all plots at the same time and at the same rate. While the size of the plots must often be governed by the number of plots required for the particular experiment, and the amount of land available, twentieth-acre to tenth-acre plots will usually be found the best where horse and machine labour are to be used. Long, narrow plots laid out crosswise to the greatest soil variation are preferable to square or oblong plots as these are more likely to show important differences in soil fertility. The four corners of any series of plots should be indicated by permanent marks. Check plots receiving a uniform soil treatment to maintain them in a reasonable state of productivity should be regularly distributed throughout the series. At least every fourth plot, preferably every third, should be such a check plot in each series and one or more untreated plots should also be included. The complete series of treatment should be repeated as many times as there are crops in the rotation employed. In all soil fertility experiments, the plots must be separated by untreated interspaces at least 3 ft. in width, and the entire series of plots should be surrounded by regularly planted side and end border strips to be cut off at harvest time. Only high quality acclimatized seed of standard variety should be used and it must be uniformly treated. The calculation of increases due to treatment should be based on the assumption that the difference between the two check plots is uniformly progressive. All cultural operations, except ploughing, should be conducted lengthwise of the plots to prevent all possibility of moving soil or fertilizer from one plot to another. Ploughing should however usually be crosswise of the plot, and hill-planted crops may be cross-cultivated. Yields ought usually to be determined by harvesting and weighing the produce of the entire plot; the produce must be uniformly dried before weighing. Should this have been omitted, the moisture content ought to be determined and proper corrections made before recording the weights.

Recommended Standards for Field Experiments With Farm Crops.—All seeds used for planting must be of known vitality and free from admixture, weed-seeds and contamination

or infection by disease. The soil for experimental plots ought to be as nearly as possible of the type prevailing in the area where the data from the crops grown on them are to be applied. As a rule, relatively long and narrow plots are to be preferred, but they must be sufficiently wide to allow for the removal of border-rows (2 in the case of cereals and 1 for intertilled crops). Practically, 5 ft. or more is a good width for plots planted with small grains and forage crops; in the case of intertilled crops, sufficient width should be allowed for 4 rows. Adequate repetition of varieties or treatments renders unnecessary the use of check plots. In fact the number of years a test is continued together with the number of plots devoted to any one variety or treatment, and the size of the plot are in definite relation to the probable error for any particular test. When single plots of varieties or treatments are used, the probable error will average lower on tenth acre plots than on plots of smaller size. The increase in probable error is however relatively small when the decided reduction in size of the plots is considered. By repeating varieties or treatments a sufficient number of times on regularly distributed plots of any size adapted to the purpose of the experiment, the probable error for the test may be reduced to any point considered necessary. For ordinary conditions, from 2 to 5 repetitions are recommended; two plots of any variety or treatment, continued through 4 years, or 3 plots continued for 3 years should be regarded as the minimum. New varieties or cultural treatments materially different from those in common usage should not be recommended for general use, unless supported by at least 3 years of repeated and carefully conducted experiments within the area for which the recommendations are made.

To the article are appended additions to the bibliography published in 3 previous issues of the Journal of the American Society of Agronomy.

CROPS AND CULTIVATION

809.—Sweet Clover as a Green Manure.—WHITING, A. L., and RICHMOND, T. E., in *University of Illinois Agricultural Experiment Station, Bulletin No.* 233, pp. 255-267. Urbana, May 1921.

Sweet clover (*Melilotus alba*) should prove a promising source for supplying nitrogen to the chief farm crops. Certain characteristics give it a marked superiority over other crops as a green manure. The most important of these are:

Adaptability to a wide range of climatic and soil conditions, if the soil is not acid and inoculation is assured; hardiness to cold and drought, resistance to disease and damage from weeds; vigorous growth; rapid decomposition whilst green, deep-rooting habit which renders impervious subsoils more porous and of higher nutritive value.

A crop that possesses the combined capacity to grow rapidly in early spring and to decompose readily, makes an ideal green manure. Owing to its rapid growth clover conserves large amounts of soluble plant food, utilizable when the soil would otherwise suffer heavy losses. Similar to other legumes, when properly inoculated, the plant can utilize atmospheric nitrogen which it stores in its roots as reserve food material. The leaves are very tender and decay immediately after the crop is turned under green. The roots and stems decay more slowly, thus the different parts represent three sources of nitrogen which furnish three rates of nitrate production.

Hitherto considered as a weed, the sweet clover is now coming to be regarded as the best crop for soil improvement. As it will supply nitrogen at a low cost, it could be employed on a large scale.

The literature concerning sweet clover as a green manure and as a source of nitrogen, is very limited. Having been classed for some time as a weed, it has received very little attention by investigators. ORTH in 1890 was the first to test the value of this crop as a green manure and proved its superiority over farmyard manure for the production of potatoes, oats and maize. G. B. HOPKINS recognized the possibilities of this plant as a green manure and in his book on "Soil Fertility and Permanent Agriculture," he states that 6½ tons of dry matter furnish as much humus and nitrogen as would be furnished by 25 tons of average farmyard manure. The appreciation of the importance of this crop is evident in that he introduced it into the rotations on several experiment stations and also selected sweet clover as the crop upon which to base his foundation work for restoration of the soils of Greece. In 1917, MAYNARD studied the decomposition for nitrate formation under glass and found it to be very rapid. He mentions that no record has been found of any study of the rate of decay of sweet clover as a green manure.

The work of MERTZ deserves attention, especially designed to compare the value of various green manures, leguminous and non-leguminous, the latter being reinforced with artificial nitrogenous fertilizers. The experiment was conducted in South California. The crops grown for green manures in the winter were followed by maize, potatoes, cabbage, beets, sorghum and Sudan hay, for six successive years. The legumes proved much superior to the non-legumes and amongst the former the bitter clover (*Melilotus indica*) an annual variety of sweet clover was the most promising, both from the standpoint of vigour, of seed supplies and as a green manure. The use of

A potash manure in a gain of nearly 20 bushels of shelled maize per acre. This compares favourably with results obtained with an annual application of sodium nitrate giving 1,080 lb. per acre of maize and of dried blood giving 1,200 lb., taking into account also the cost of these fertilizers.

The advantage of utilizing the crop as a manure has been proved by the authors in their experiments made (1918-19) on 5 especially selected fields in northern, central and southern Illinois, in connection with the University farms, Urbana. A series of plots was arranged as follows: sweet clover; green manure, control; to the sweet clover and manured plots, rock phosphate or bone-meal was added once in four years. On the sweet clover green manure plots, residues were added to compensate for corn stubble. A distinction should be drawn between available and non-available nitrogen as it is most important to keep as much nitrogen as possible in the available form. This is exactly what happens in the case of leguminous crops, which help to contribute large quantities of available nitrogen. The results obtained by the authors indicate that after digging in, the sweet clover tends to increase the proportion of nitrates in the soil, even more than heavy application of manure. In poor soils, the effect is even more marked. The maximum nitrate production was noticed in August which suggests the advisability of ploughing under at an earlier date, and so avoiding any detrimental effect (due to decomposition) on the germinating maize. Another suggestion is the utilization of the surplus nitrate by sowing a catch crop. When maize is the main crop, the value of the additional nitrate remains although quickly utilized by the crop. Even when manure, lime and phosphate have been used in large quantities (5 times normal application) the yields were not equal to those obtained after sweet clover.

The average for the 2nd year sweet clover crop was 87·6 lb. nitrogen per ton of dry matter, the cutting was made before sowing the maize. The subsequent advantage was evident.

These results furnish positive information concerning the value of sweet clover when used as a green manure, for adding to, conserving and making available for crop purposes the nitrogen of the soil. It is well known that, except for manure, the animal sources of nitrogen (dried blood, tankage, residues, guanos) are scarce and costly and therefore unsuitable for use on a large scale. This applies also to the use of commercial fertilizers (sodium nitrate, sulphate of ammonia, ammonium phosphate and calcium cyanamide). On the other hand, the leguminous crops offer an exceptional advantage, and sweet clover in particular may in the future occupy a prominent position as a green manure.

692.—**The Effect of Straw on the Biological Soil Processes.**—MURRAY, T. G., in *Soil Science*, Vol. XII, No. 3, pp. 233-259, bibliography of 14 works. New Brunswick, N.J., Sept. 1921.

In the wheat-growing areas to the east of Washington the return of straw to the land constitutes the only practical method of restoring organic matter to the soil, but it is known that this reduces the yield of the succeeding crop.

It was considered advisable to ascertain the reason for this reduction in crop yield, and if possible to devise a method by means of which the straw could be utilized without this drawback.

The matter had already received attention: STORMER showed that the addition of carbon bisulphide to a soil treated with straw doubled the yield. VAN SEELHORST and FRECKMANN found that when nitrates were applied, denitrification was proportional to the amount of straw present, and that lime and sulphuric acid lessened, but did not overcome the effect of the straw on the crop yield. CHIRIKOV and SCHMUK state that on sandy soils calcium carbonate acts in the same manner, and that the injurious effect of the straw is not due actually to denitrification, but to the conversion of nitrates into insoluble nitrogen compounds. BISCHOFF grew mustard and buckwheat and found that on sandy soils the injurious effect of straw was more marked than in the case of clay soils and that nitrate of soda reduced the loss. VON MAY studied the effect of straw on potatoes and suggests that the loss is caused by the fact that micro-organisms appropriate the available nitrogen as a source of energy. DORYLAND in the case of oats, found that the addition of straw in large quantities to the soil caused a decrease in the ammonifying power and an increase in the consumption of ammonia and nitrates; these results were due to an increase of micro-organisms favoured by the addition of straw, the same effect being produced by the addition of dextrose to soil.

The author placed soil in glass tumblers containing about 130 gms. and added finely chopped straw in amounts from 0·1 gm. to 5 per cent and 0·2 gm. of ammonium sulphate.

The tumblers were kept at a temperature of 20° C. And the work was carried out in duplicate, with controls. Determinations of nitrate content and total nitrogen were made every six weeks.

After 18 weeks, there was a loss in every case in nitrate formation, and a reduction of the original nitrate content, proportional to the addition of straw. When more than 0·9 per cent straw is present a harmful effect is exerted upon the process of ammonification. At the same time, the total

nitrogen remained constant, the nitrates being transformed into organic substances not available to plants. The bacteria increased in numbers, and evidently utilized the nitrates and changed them into more complex forms. The straw also served the bacteria as a source of carbon and the nitrates as a source of nitrogen. The organisms found to multiply in this manner are those usually present in the soil, such as *B. subtilis* and *B. mezatherium*.

Many others were found when straw was present, e.g. *B. siccus*, *B. lactis*, *M. radiatus*, but those normally found in soil predominated. The colonies had a softening effect on agar-agar, probably due to the setting free of nitric acid.

The author isolated a species of nitrifying bacterium capable of liquifying agar-agar in a few weeks.

693.—**The Influence of Wheat Straw on the Accumulation of Nitrates in the Soil.**—Scott, H., in *Journal of the American Society of Agronomy*, Vol. 13, Nos. 6-7, pp. 233-258, bibliography of 28 works. Lancaster, Pa., and Washington, D.C., Oct. 15, 1921.

The application of straw to cropped land and its apparently injurious effects, indicates lack of nitrogen and led the author to undertake a study of the effect of straw on the accumulation of nitrates in the soil.

The general problem of organic matter and nitrification has occupied the attention of a large number of investigators. The author reviews the literature on this subject. Winogradsky and Omeliansky showed that glucose and the peptones retarded the activity of the nitrifying organisms at concentrations exceeding 0·025 per cent; their work being completely arrested by the presence of 0·2 per cent of these substances.

Small quantities of organic matter did not seem, however, to hinder nitrification. As regards the straw, results are contradictory and depend on the amount applied, the type of soil, the quality of the straw, etc. This accounts for the fact that Hill noted a favourable effect, Wright found that the process of nitrification was inhibited until decomposition was well advanced, and Niklewsky demonstrated that straw has an appreciable effect on the action of sulphate of ammonia and nitrate of soda.

The author carried out an experiment under glass and in the field. Nitrate determinations were obtained by the phenol-disulphuric acid colorimetric method of analysis and parallel determinations were made from time to time using the aluminum reduction method.

In the experiments under glass, straw was applied at the rate of 0·5 and 1 per cent. In both cases the nitrates disappeared almost entirely at the end of 15 days. At the end of 36 weeks, the soil with 0·5 per cent straw slightly exceeded the control. If sulphate of ammonia is applied to the straw (0·1 and 0·5 per cent) for 2 weeks, there is a marked decrease in nitrates, but this is followed by a rapid increase up to a maximum of 2·1 per cent of nitrates compared with 0·35 for the control, and 0·30 in the soil to which straw alone had been applied.

In the field several plots of equal size were treated in various ways. The soil is a silt loam and straw applied at the rate of 2 and 4 tons per acre had a distinctly injurious effect on the growth of wheat, hindered ripening and reduced the yield except on plots possessing a high nitrate content at the time when the straw was applied.

In one case, the yield was higher than that of the control. Otherwise, when 4 tons of straw per acre were applied and worked into the surface 6 inches, the nitrate content was low in the spring, but during the summer, the equilibrium was re-established. At the rate of 2 tons per acre, no effect was observed. Four tons of straw applied as a top dressing reduced the nitrate content the following spring and summer; 2 tons had no effect in the spring but a fairly marked increase of nitrates in the summer. Straw application showed the lowest temperature and the highest moisture content, especially as a top dressing.

564.—**A Monograph on the Wheat Plant.**—*Nature*, Vol. 109, No. 2734, pp. 366-368. London, March 23, 1922, and reviewed in *The Gardeners Chronicle*, Vol. LXX, No. 1827, p. 331. London, Dec. 31, 1921.

Prof. J. Percival's monograph on the wheat plant, recently published, fills one of the many great gaps in agricultural literature and is a noteworthy contribution to present day knowledge on this ever important subject. It will be read and admired in all countries, and for many years to come. Every detail is founded on the author's own personal experience and the study is peculiarly exhaustive.

The introduction shows how widespread is the cultivation of wheat and it is interesting to note that there is no month in the year during which the wheat harvest is not being carried on in some part of the world. This is indicated as follows:

January: Australia, New Zealand, Argentina, Chile; *February:* India; *March:* India, Upper Egypt; *April:* India, Persia, Asia Minor, Lower Egypt, Mexico, Cuba; *May:* Japan, China, Central Asia, Morocco, Algeria, Tunis, Texas; *June:* South of France, Spain, Italy, Greece, Turkey, Japan, United States (south of 40°); *July:* France, Germany, Austria, Hungary, Roumania, Bulgaria, S. Russia, Canada, N. United States; *August:* England, N. France, Belgium, Holland, Central Russia, Canada, United States; *September:* Scotland, Sweden, Norway,

[illegible] into "varieties" follows the well-known system in KORNICKE and WERNER'S "*Handbuch des Getreidesbaus.*" It should be noted however that certain forms have been transferred quite rightly to other groups *e.g.* several forms placed by KORNICKE in *T. durum* are transferred to the emmer group *T. dicoccum*, and the Persian Black (*T. dicoccum* var. *persicum*) a form which has puzzled more than one specialist is also placed in this group, to the satisfaction of those interested in the genetics of this important mildew-resisting wheat.

A specially detailed description is devoted to the common bread-wheat, with the numerous bearded and beardless varieties (pp. 265-306). The predominance of these last may be attributed to the digestibility of the flour and the endurance of the plant. The most ancient of cereals, *T. vulgare* now exists in some 14 varieties (7 bearded and 7 beardless), which are easily classified by the colour and degree of downiness of the glumes.

The systematic portion of the monograph is followed by a chapter of considerable interest on the origin and relationships of the races of wheat. Evidence from various sources, archaeological, ecological, pathological, genetical, etc., is skilfully marshalled to show their probable lines of development. The author as a result of his morphological studies comes to the conclusion that "there is not nor has there ever been a prototype of the bread wheats" and that "the characters of *T. vulgare* and its allies appear * * * to be those of a vast hybrid race initiated long ago by the crossing of wheats of the emmer series with species of Aegilops." He adopts the view that the present day wheats fall into the 3 series already mentioned. The multiplicity of the races is doubtless connected with the fact that, although as a rule self-fertile, wheat is occasionally cross-fertilized and results in consequent natural hybridization.

Artificial hybridization was first started at the end of the XVIIIth century by KNIGHT, but no definitely important results were obtained until 1846 when MAUND and RAYNBIRD produced undoubted hybrids. Since then hybridization has been carefully followed up and important results have been obtained. For example, BIFFEN who first investigated the inheritance of resistance and susceptibility to the attacks of yellow rust (*Puccinia glumarum*) discovered that these characters form a Mendelian allelomorphic pair, and working on this basis, a means of circumventing rust by the production of immune varieties was worked out. A useful summary of most of the more important literature dealing with hybridization and improvement of wheat is given, with details of the most recent hybrids obtained.

The concluding chapter contains an interesting survey of the yield obtained in different

countries, the world's average being 13 bushels per acre. Historical research shows how greatly the yield has been increased during the last few hundred years. With the increase in stock raising and the consequent increase in the amount of manure available, there has been a steady rise in yield. Records show that for Great Britain in the XXth century, the average for the first 20 years was 31 bush. as compared with 10 bush. in the XVIIth century. Occasionally there have been exceptional results: e.g. 96 bush. per acre of Yeoman wheat at Wye, Kent (England), in 1918 and 117·2 bush. per acre in Island County (Washington, U.S.A.), in 1895.

Prof. PERCIVAL also gives details of the effect on yield of soil, cultivation and manuring, seed rate, variety, time and methods of sowing, and size of grain, etc.

570.—**A New Flax Seed in Ireland Giving an Exceptionally High Yield of Good Quality Fibre.**—In *Journal of the Royal Society of Arts*, Vol. LXX, No. 3619, pp. 360-361. London, March 31, 1922.

A new pedigree flax seed has recently been produced by Dr. VAGAS EYRE, Director of the Linen Research Association Institute at Lisburn, near Belfast. Two new varieties of the Livornian strain were discovered, which, on being tested, gave 80 per cent more fibre than any other flax seed on the market and the quality was on the average two grades higher.

It is estimated that the return is 100 per cent better than from the Duroc flax seed hitherto grown and it is reported by a well-known linen manufacturer that the spun yarns are of a more uniform quality. At present there are approximately 5 tons of this seed available.

Further distribution and commercial utilization is under consideration, and while a portion will be given to Irish flax growers another portion will be forwarded to the National Institute of Agricultural Botany at Cambridge, and the remainder sent to Canada, where climatic conditions are favourable for seed development.

405.—**A Bio-Chemical Index for Determining the Vitality of Seeds.**—NEMEC, A., and DUCHON, F., in *Comptes rendus de l'Academie des Sciences*, Vol. 174, No. 9, pp. 631-634. Paris, February 1922.

The authors have shown (*Comptes rendus* Vol. 173, 1921, p. 933) that the activity of the catalyst affords a rapid and easy means of determining the vitality of seeds. They adopted the following method: 2 gm. of finely ground seeds are mixed with 20 cc. of distilled water and put into a flask with a rubber stopper provided with two holes through one of which passes a funnel with a regulating tap, while an escape tube with two bends passes through the other and thence into a vessel of water and under a gasbell graduated to tenths of a cubic centimetre. By means of the funnel are introduced 15 cc. of 3 per cent oxygenated and neutralized water and the amount of oxygen liberated is measured after 5 minutes, and later after 15 minutes.

The results of many experiments have demonstrated that all other factors being equal, the amount of water decreases regularly with the weakening of the germinating capacity.

These results expressed graphically give a regular curve and thus the germinating power of the seeds can be deduced from the amount of oxygen liberated.

In practice, it is well to use the comparative method, and to compare the catalytic activity of the ground seeds under examination with the graphic curve obtained under the same conditions from seeds of known germinative power.

414.—**The New Chinese Variety of Lucerne in South Africa.**—DONKIN, J. E., in the *Journal of the Department of Agriculture, Union of South Africa*, Vol. III, No. 3, pp. 257-258. Pretoria, Sept. 1921.

FAIRCHILDS, the "Agricultural Explorer" of the United States Department of Agriculture, found in Thibet, at a height of about 1,200 feet above sea level, a new variety of lucerne growing on the edge of a swamp. This variety has been tested for a period of five years at the School of Agriculture of Grootfontein near Middleburg, Cape Province, where for purposes of comparison it has been grown side by side with six other well known types.

Although during the first period of growth this "Chinese" variety, as it has been called, could not be considered as equal to the "Provence" and "Tamworth" types, owing to thin seeding, in the last two years of the test it gave hay crops almost equal to those of "Provence" and superior to those of "Tamworth." Observations taken seem to show that "Chinese" lucerne is a hybrid, and several variations in stalks and leaves, etc., are noted. It is a heavy cropper and particularly resistant to frost.

If grown for seed, 1 oz. is sufficient for a row 100 yards long, which in the second year should produce enough seed for one acre; this should in turn produce a sufficient quantity of seed for sowing broadcast several acres every year.

580.—**The Cultivation of Blueberries (Whortleberries) (Vaccinium Spp.) in the United States.**—COLVILLE, F. V., in *United States Department of Agriculture Bulletin No. 974*, pp. 1-24, plates 29. Washington, 1921.

Experiments in *Vaccinium* cultivation have been in progress in the United States since 1906 and up to the present, 16 acres

excellent yields, the second summer after burning.

The industrial advantages attached to this crop are evident after observation of the yields and returns recorded at Whitesbog (N. J.) viz., an average yield of 96 bushels per acre, sold at rather more than $10 per bushel, the receipts being at the rate of $966 per acre. This record refers to plants 7 years old. The following year (1920) this planting yielded at the rate of 117 bush., i.e., $1,280 per acre. After a plantation has been once established its maintenance is relatively inexpensive.

LIVE STOCK AND BREEDING

598.—**The Use of Calcium Salts in the Feeding of Animals.**—*Ohio Agricultural Experiment Station, Bulletin* 347, pp. 99. Wooster, Ohio, 1921.

The bulletin analysed contains the following 6 papers:

I. Forbes, E. B., Halverson, I. O., Morgan, L. E., and Schulz, J. A. *The Metabolism of calcium salts in a growing pig.*—Experiments to determine the metabolism of the mineral constituents of the ration, were carried out in November-December 1917, with 5 young castrated boars of the Poland China Breed. There were three experimental periods of 10 days each, separated by intervals of 7 days. To a basal ration consisting of maize flour + linseed cake + wheat sharps (7 : 1 : 1) with salt in the proportion of I : 450, were added various mineral supplements.

It was found that the characteristics of the metabolism of swine fed almost exclusively on the grain of cereals were as follows: loss of calcium, abnormal gains in magnesium and phosphorus, very acid urine containing much ammonia. An excess of potassium was present in the basal ration, whereas sodium and chlorine, except for the small quantities supplied in the form of kitchen salt, were lacking.

The insufficient assimilation of calcium is an important factor in determining the gains in phosphorus and to a lesser degree, in magnesium. The increasing ingestion of calcium in the form of precipitated carbonate or powdered limestone, causes a marked increase in the calcium, magnesium and phosphorus gains.

The addition of 1 part of salt to 450 parts of grain, the basal ration, causes a gain in both sodium and chlorine. The gains in sodium and potassium were, as a rule, almost equal. The gain in sodium was more quickly satisfied than that of chlorine. All the mineral additions, especially the precipitated bone-meal, served to increase the chlorine gains as compared with the basal ration, without any addition.

The magnesium content of all the rations was sufficient. When the magnesium metabolism was negative, the loss was due to the hindering effect of other factors, especially to insufficient ingestion of calcium. All the mineral additions had a favourable influence upon the magnesium gains. In some cases, the improvement of the latter were to be attributed entirely to the increase in the amount of calcium ingested.

Ground limestone, precipitated bone-meal, degelatinized bone-meal and precipitated carbonate calcium had much the same effect on the calcium gains, whereas ground mineral phosphate was clearly less effective.

The gain in phosphorus was distinctly increased by all the additions containing calcium, whether in the form of the carbonate or the phosphate.

The solubility of the compounds seems to be the chief cause of the gains; precipitated calcium carbonate and precipitated bone-meal are the most effective, ground mineral phosphate having much less effect. Compared with the potentially acid, basal ration, the compounds containing calcium carbonate lowered the acidity and the ammonia of the urine, but precipitated bone-meal (containing bicalcic phosphate) increased them.

Mineral additions had no effect upon the digestibility of the ration.

One-third of the sodium evacuated by the organism was found again in the urine and one-third in the faeces.

Generally, over 90 per cent of the chlorine passed into the urine.

The capacity possessed by the digestive apparatus of absorbing mineral foods is limited in the first place by their solubility and afterwards, amongst other factors, by the rapidity with which these substances pass from a soluble to an insoluble condition in the blood and lymph, either by means of a synthetic process, or as a result of excretion. The gains in absorbed mineral nutrient substances are governed by the requirements of nutrition, and are not increased by limiting elimination which would immediately decrease absorption.

The most effective, and certainly the most soluble mineral additions used were precipitated carbonate and precipitated bone-meal. Other compounds may be more practical, though less effective, if the pigs will eat them and can tolerate them when fed in sufficient quantities. The most urgent mineral need of growing animals, after common salt, is satisfied by calcium carbonate. When, however, the assimilation of the phosphorus, which is normally present in the ration for the building up of the skeleton, is thus assured, some form of calcium phosphate must be given.

With a certain loss of phosphorus, all the need for mineral additions can be satisfied by calcium phosphate. The phosphate is dearer than the carbonate, but it is more easily tolerated, and if fed separately from the ration, is more acceptable to the stock.

II. Forbes, E. B., Halverson, J. O., Schulz, J. A., and Wells, E. B. *Metabolism of some calcium salts in growing swine.*—A second experiment to ascertain the metabolism of the mineral constituents of the ration was carried out from August to October, 1918 with 4 castrated pigs of the Poland-China breed. The chief object of the experiment was to compare the effects of the addition of mixed minerals with those of minerals introduced separately. The results connected with the metabolism of calcium, magnesium and phosphorus are given.

As in the preceding experiment, the metabolism of sodium, magnesium, chlorine, sulphur and nitrogen was also studied. The results were practically the same, although there was a larger proportion of potassium in the urine. The authors bring out the independent behaviour of sodium and chlorine. All additions containing calcium were useful, from 5 to 10 tenths of the calcium administered was retained by the organism; no appreciable difference existed in the capacity of assimilating the various additions.

III.—Forbes, E. B., and Schulz, J. A. *The effect of mineral additions upon the development of swine.*—Thirty Duroc-Jersey pigs of the average weight of 136 lbs. were divided into 5 lots and given experimental rations for 86 days dating from April 30th, 1917. The basal ration was the same as in the two previous experiments. The mineral additions were chosen so as to supply 5 mg. of calcium per head and per day. At the end of the experiment, the animals were slaughtered and their skeletons physically and chemically examined. The pigs of the lot given precipitated calcium carbonate and those which received precipitated purified bone-meal had relatively compact, strong skeletons, whereas the bones of the pigs that had been supplied with ground mineral phosphate were only a little denser than the bones of the control animals (ration without supplementary calcium salts) and were less resistant than those of the latter, as well as containing a smaller amount of ash per unit of volume. The skeletons of the pigs given precipitated bone-meal occupied an intermediate position as regards density and resistance. The proportion between the phosphorus and calcium present in the bones of pigs was fairly high whether they had received mineral phosphate, or the basal ration. In this, the bones differed from those of the young animals killed at the beginning of the experiment in order to determine their initial composition, in which the proportion of the magnesium present in the skeletons of the young pigs was relatively lower than that of the calcium.

IV.—Forbes, E. B., Hunt, C. A., Schulz, J. A., and Winter, A. R., *Effect of mineral addition on the development of swine.*—The experiments described in this paper began on July 26, 1919, and lasted nearly 16 weeks. They differ from the preceding experiments in that the mineral addition instead of being mixed in a given proportion with the rest of the ration, was fed separately and *ad lib.* Further, a larger number of additional substances were given and more determinations of the physical characters of the bones were made. The pigs were hybrids with a predominance of Duroc-Jersey and Chester-White blood.

The animals were divided into 8 lots each containing 5 individuals with an initial weight of about 46 lb. per pig. The basal rations consisted of maize flour, wheat sharps and linseed meal cake (3 : 1 : 1) with the addition of one part in 500 of kitchen salt. The mineral additions were given to 7 lots in the buckets of an automatic distributor, 5 per cent of sodium chloride being added each time. During the first 5 weeks, the pigs did not relish these additions to their ration, but later when they were shut up in a brick-paved stye, they ate them in large quantities. The additions given to the various lots, the amounts eaten, and certain characters of the bones determined after the animals were slaughtered are summarized in a table.

The penetrability (hardness) was determined by means of a specially constructed microdynamometer measuring the penetration of a diamond-pointed punch 5 mm. in diameter under a pressure of 9 kg. The operation was carried out upon a transverse section from the narrowest part of the diaphysis; its faces were exactly parallel, and polished by a special apparatus. Both these machines were invented by Dr. Joseph Hyatt, of Philadelphia.

Mineral phosphate did not make the skeleton stronger as compared with the effect of the ordinary ration without any addition, whereas all the other mineral supplements produced considerable and almost identical increases in the strength of the bones.

Degelatinized purified bone-meal makes the bones damp, less fat and more acid (both as regards volume and dry fat-free material) than any other mineral addition. The calcium and carbon dioxide contents (except the hardness) exceeded those of all the other lots, but the magnesium content was the lowest of all. The bones of the control lot were relatively poor in mineral constituents other than magnesium.

The hardest bones were characterized by a larger proportion of calcium, carbon dioxide, and ash, and by the low magnesium content of the fat-free, dry bones, as well as by the smaller amount of magnesium in the total number of mineral constituents determined (calcium, magnesium, phosphorus and carbon dioxide).

The softest bones were characterized by the larger amount of magnesium and phosphorus and the smaller quantity of calcium and of carbon dioxide in the total of the constituents determined.

The difference between these two lots bring out the relative value of ground mineral phosphate and of purified bone-meal as mineral supplements for young animals. The mineral substance of bones is a mixture of carbonates and phosphates capable of change as a result of the selection of the carbonates serving as part of the alkali reserves of the organism. The authors are of opinion that in lots 1 and 8, the low proportion between carbon dioxide and the phosphorus of the bones shows that some elimination of the calcium carbonate has taken place to compensate for the lack of potential alkali. This causes the formation of softer bones owing to the large proportion of magnesium phosphate.

V.—Forbes, E. B., *Additional foods consisting of more or less appetizing mineral preparation for swine, cattle and horses.*—The author has made 19 experiments with pigs and 15 with cattle; he has found that horses also readily eat precipitated bone-meal and purified degelatinized bone-meal.

In these experiments with pigs, the author observed that purified degelatinized bone-meal, which under certain conditions, was the most liked, could be rendered still more acceptable by the addition of a little acid.

Meat meal increased the flavour of the mineral supplement with which it was mixed; the best results are obtained with blood meal, Coriander seeds, and molasses also increased the flavour of the added minerals, but not as much as the above-mentioned meals. On the other hand, anise, fenugreek, caraway, fennel, charcoal, humus and grould lucerne hay had no effect. Preparations in the form of fine powder caused disturbances.

VI.—Forbes, E. B., Halverson, J. O., and Schulz, J. A.—*The effect produced upon the alkali reserves of the pig by a diet of grain and mineral supplements.*—Two pigs were fed a basal ration composed of maize flour + wheat sharps + linseed-cake + kitchen salt for 33 days. This period was followed by another during which precipitated calcium carbonate was added to the ration and the experiment terminated with a further period of 23 days during which precipitated bone phosphate was added to the basal ration.

The mineral additions were given at the rate of 0·2 gm. per kg. of live weight.

The consumption of calcium carbonate, which is potentially basic, increased the carbonate dioxide pressure of the blood plasm and decreased the ammonia content and the hydrogen ion concentration of the

urine. Bone phosphate, being potentially acid, had just the opposite effect. It is therefore probable that the alkali reserves of the blood plasm can be greatly altered by the character of the mineral substances added to the ration.

739.—The Application to Stock-Breeding of Some New Views Concerning Heredity. —DECHAMBRE, P., in *Comptes rendus de l'Académie d'Agriculture de France*, Vol. VIII, No. II, pp. 359-365. Paris, March, 1922.

The progress of stock-breeding is intimately connected with the possibility of fixing by heredity the variations, or characters, that will improve the quality of animals. Hence the attempt to apply to stock-breeding the knowledge obtained from the researches on heredity that have been carried on for several years in the scientific world.

From among the new facts concerning heredity that are of almost direct application to stock-breeding, the author singles out for special mention those bearing on the dominance of certain characters.

Generally speaking, albinism in all species is recessive. Thus, the products of a cross between breeds with pigmented mucous membranes and those with non-pigmented mucous membranes have coloured mucous membranes. Of this there are several instances in cattle: the hybrids of Charolais X Schwitz in the District of Aube and Côte d'Or are white like the Charolais breed, but have a black muzzle; the hybrids of Charolais X Vendée breed are large animals with light coats, but black mucous membranes and legs; the hybrids of Limousin X the Brown Cevennes breed have the good conformation of the Limousin parent but black coat and legs.

Southdown rams, when crossed with white ewes, produce lambs with greyish faces and legs.

As dominant characters the author mentions the tuft of the Paduan fowl and the long hair of the guinea-pig. In horses, black and bay coats are dominant as regards chestnut, and grey and roan as regards bay.

In cattle, hornlessness is dominant as regards the possession of normal horns. When a polled bull is crossed with a normally horned cow, polled offspring are obtained. This was discovered in England a long time ago by crossing the Angus and Shorthorn breeds. The Sarlabot breed originated from a similar cross between the Normandy and the Angus and Red Polled breeds. This cross was effected in 1852 and the polled character of the progeny was immediately fixed. For the last fifteen years, the author has used the Sarlabot breed in his crossing experiments at Grignon, where its essential character, absence of horns, proved itself to be dominant.

Early maturity, and high milk yield are some of the dominant physiological characters.

Dominance does not, however, always manifest itself even when the contrasting characters are well-marked. Piebald lambs with large black and white patches and "half-tail" resulted from the crossing at Grignon of a Berrichon ram with slender tail, and Somali ewes with thick tail, white body, and black head and upper portion of the neck.

Some colours are sex-linked, thus if a silver Hamburg hen is crossed with a golden Hamburg cock all the hen chicks are golden and all the cockerels silver.

Although the products of the first cross are generally very much alike owing to the presence in the parents of dominant and recessive characters, all homogeneity is lost when the hybrids are mated up together and the recessive characters again make their appearance.

This was discovered some time ago by the Marquis of Behague in the case of Southdown X Berrichon lambs and it is therefore not advisable to mate hybrids together, but to obtain them direct by the crossing of pure-bred parents. This is very commonly done amongst sheep breeders supplying the meat market, and is now gaining ground among cattle-breeders, pig-breeders and even poultry rearers in the case of produce destined for the table. The author maintains that equally good results could be obtained by extending the same practice to horses.

"As soon as experimental research work has been continued sufficiently long for it to be possible to determine the reciprocal relations of the dominance and recessiveness of many characters the breeder will be able to know beforehand the characters that will reappear in the hybrids and thus be in a position to obtain, at least to some extent, animals suited to satisfy the needs of the moment, or the requirement of any particular market."

For this reason the author is of opinion that "one of the great objects of the Stock-Breeding Research Laboratories should be the study of new methods of propagation based on scientifically conducted experiments, and applicable to practical stock-raising. The methods could either be applied directly, or after they have proved effective by testing them at special institutes under the direction of the agricultural authorities, and at stock-breeding centres."

743. Advantages of Heavy Feeding of Milch Cows.—Ross, H. A., in *Circular No. 240—Illinois Agricultural College and the Creamery and Milk Plant monthly*, Vol. VI, No. 5, p. 35. Chicago, March, 1922.

The author states that the present prices of butter fat make it possible to dispose of farm produce at prices much above their present market value, when heavy feeding of cows is practised.

In Illinois, good cows are returning 85 cents per bushel of maize, $24 per ton for hay, and $9.50 per ton for silage, on the 35 per cent butter fat basis. These results have been obtained from the Illinois Agricultural Experiment Station and refer to records for 528 cows.

The average daily production amounted to 28 lb. of 4 per cent milk per cow for the six months, November to April, and a total of 92,095 lb. butter fat.

The feeds consumed during the period were as follows: *for the 528 cows:* 893,688 lb. concentrates + 831,954 lb. hay + 2,229,314 lb. silage; *per cow* respectively, 1,693 lb. + 1,576 lb. + 4,222 lb.; *per lb. of butter fat produced*, 9·7 lb. + 9·01 lb. + 24·2 lb.

These cows varied as to size, breed production and date of calving, but were typical of good milch cows found in Illinois.

If the concentrates in the ration consist of 2 parts maize and 1 part bran, and if the hay which is fed is a legume, the ration is well balanced and economical. With the bran costing $18 per ton cows like those studied, should give a return as follows: butter fat at 30 cents per pound per bushel of maize, $0.70, per ton of hay $20.50; per ton of silage, $8.00; butter fat at 35 cents per pound; respectively (maize, hay and silage) $0.85, $24.00 and $9.50; butter fat at 40 *cents* per lb., $0.95, $28.00 and $11.00.

Only the food costs are included in this estimation; the incidental expenses of the dairy and the value of the skim milk are neglected.

Under existing conditions it is therefore evident that heavy feeding of milch cows is profitable, the increased grain ration is advisable as long as there is a corresponding increase in milk production, without a marked gain in body weight of the cow.

Where a legume hay is not available the ration maize + bran + silage + hay may be supplemented by linseed oil meal at the rate of 0·75 to 1 lb. per cow per day depending upon the amount of milk produced.

744. Nutrient Requirements of Growing Chicks.—Mitchell, H. H., Hamilton, T. S., and Haines, W. T., Nebraska Experiment Stations, in *The Journal of Agricultural Research*, Vol. XVII, No. 3, pp. 109-139. Washington, Oct. 15, 1922.

Investigators in the field of nutrition have noted that chickens behave unlike rats or swine when limited to rations of one type, such as wheat or maize; this led to an enquiry into the values and deficiencies of the common feeding stuffs used for poultry and egg production.

The author carried out a large number of experiments and proved that maize is not a satisfactory food on which to rear chicks.

The chicks chosen for the experiments were selected with great care; all were of the same age, viz., ten days; of equal vigour and development, and each group of nine was apparently uniform in all respects. The chicks were weighed individually every seven days and the figures obtained set out in graphs, the curves being typical of each group.

The ration was given in two parts; one as a coarse, the other as a fine feed; with the fine, or mash feeds, were mixed the supplementary ingredients, the effects of which the authors wished to study.

The results showed that maize is deficient in essential qualities, and is not suitable for the complete nutrition of growing chicks which on this ration could not develop and ultimately died.

The addition of 5 per cent of mineral substances, such as bone-ash, sulphur, salts of calcium, sodium and iron, were of assistance and made possible a slow, but continuous growth. The inclusion of maize gluten was ineffective.

The addition of 15 per cent purified casein produced a marked improvement; it appeared that the casein supplied amino-acids, in which maize is deficient.

Supplementing the basal ration with other proteins, such as egg albumin and gelatin, lowered rather than raised the efficiency of the ration, and soya-bean meal was equally ineffective.

The addition of butter had no result; the fat contained substances which may have stimulated growth and so masked temporarily the lack of other essential accessories. There was a slight improvement in condition followed by a loss of weight until the chicks died.

The addition of green foods brought about a decided improvement; green wheat was given in abundance, and eaten by the chicks to the extent of about 5 per cent dry weight, of the whole ration. The helpful influence of green food may have been due to an improvement in the physical condition of the ration, and to a stimulating effect on the appetite.

Further experiments are now being carried out to ascertain the specific action of green foods.

With a ration formed of maize 65 parts, casein 15 parts, ash mixture 5 parts, starch 10 parts and unlimited green food, satisfactory growth to adult and egg-production stage was achieved, although the chickens

were confined in a small pen under unfavourable conditions.

756.—**Problems of Incubation.**—LAMSON, G. A. (Connecticut Agricultural College) in *The National Poultry Journal*, Vol. II, No. 82, pp. 396-397.

The factors influencing incubation are numerous; they may be divided into factors having to do: (1) with the collection, selection and care of eggs before placing them into the incubator; (2) with the handling and care of the eggs during incubation.

At the World's Poultry Congress held at the Hague in 1901 the author presented the following rules, as a result of the study of the physiological development of the embryo and practical experience.

The eggs should not be kept more than 16 days previous to incubation and the freshest eggs are best. The temperature should not exceed 90° F. Eggs should be kept lying on their sides in a dry place, as moisture tends to increase the possibility of infection through the shell. Recent investigation has shown that there is little or no value in turning the eggs previous to incubation. Eggs laid early in the season and kept at low temperatures take longer to incubate.

It is not possible to determine sterility, fertility or sex from the size or shape of the egg.

The use of large eggs for hatching is recommended on the ground that the size of the egg is a matter of heredity. Very large eggs however, as a rule do not hatch as well as medium sized eggs. Eggs with very porous or flaky shells with marked inequalities in thickness, do not hatch well. Very thin shelled eggs are likely to be broken during incubation. Excessively dirty eggs should not be used, and it may be advisable to wash eggs before incubation.

A thin muslin curtain tacked over the window will keep out direct sunlight and strong air currents.

Incubators should be set level in order to prevent warm places in the air chamber; incubators should be started 2 or 3 days before the eggs are placed in them.

To ensure the development of the embryo without delay, the temperature should be regulated at 104° or 105° F. before putting in the eggs, and then maintained at 103° F. If the period of incubation is lengthened the tendency is to decrease the numbers of eggs hatched. The regulation of the temperature is of great importance, especially during the first five days of incubation. It is doubtful if varying the temperature during the three weeks of incubation has any advantage over a uniform temperature of 103° F.

Tests made with about 10,000 eggs, using the calorimetric method in incubators with varying relative humidity, gave the following results, which indicate that there may be a wide variation in humidity without much danger.

EFFECT OF HUMIDITY ON INCUBATION

Relative humidity	Average loss of weight per egg		Per cent of fertile eggs hatched
Per cent	gm.	Per cent	
70–80	3·03	5·3	45·5
60–70	4·96	8·7	62·1
50–60	5·61	9·8	69·3
40–50	5·82	10·2	68·6
30–40	6·57	11·5	68·6
20–30	8·22	14·5	60·6
15–20	9·94	14·7	48·0

The method of incubation in rooms above a cellar has proved difficult owing to the fact that the conditions of humidity are very different from those in most rooms below ground level.

The practice of cooling eggs during incubation is not recommended. It is incorrect to say that cooling affects the vitality of chickens; out of 500 chickens, 34 had died at the end of 4 weeks, 20 of which had been cooled during the incubation and 14 had not been cooled.

Ventilation may vary to a fairly large extent without any deleterious effect; only when the carbon dioxide reaches 15 0/00 is the danger noticeable. If the ordinary incubator is well ventilated the question of carbon dioxide is negligible.

Eggs should be turned from the third day of incubation and at frequent intervals until at the point of hatching. It has been found that eggs turned at least 5 times during each 24 hours have given somewhat better results than those turned twice, and the latter showed an improvement on those turned only once. The common practice of turning each morning and evening is advisable from the economic standpoint. When turning it is advisable also to change the position of the eggs on the tray, thus equalizing the effects of minor variations in temperature that may occur in the incubator.

The individuality of the hen has a marked influence on the vitality of the embryo; out of 1,003 eggs laid by 18 hens, only 7 were sterile, whilst nearly 600 from the same number of eggs from other sources were sterile. Hatching has varied from 90 per cent from some hens to 30 per cent with others. The choice of the mother hen is therefore probably the most important feature in incubation. There is less variation in vitality with the embryos of male-birds.

At the present time, the all important question is how to increase the vigour and strength transmitted from the hen to the embryo by means of wise selection of mother hens, proper feeding, good housing, exercise, etc.

620.—The Treatment of Contagious Entero-Hepatitis in Turkeys With Ipecacuanha.—Hisset, N., in *The National Poultry Journal*, Vol. II, No. 92, P. 584. Westminster, March 1, 1922.

The author reports the good results obtained in treating a flock of turkeys suffering from contagious entero-hepatitis, with ipecacuanha as advised by Dr. H. M. Wightman and Dr. Paul Wightorth of San Diego (California). The healthy birds are at once separated from the diseased birds, the which are given 10 drops per head of fluid extract of ipecacuanha, 3 times a day for 3 days, then twice a day for 3 more days, and finally once a day for 3 days. Turkeys which were in good health, but had been in contact with infected birds, were given powdered ipecacuanha, the dose being one teaspoonful for every twenty turkeys, given in their food, until the flock showed no further symptoms of disease.

The treatment was completed by a thorough cleansing and disinfection of the poultry-house.

623.—The Dryden Method of Choosing Laying Hens.—*The National Poultry Journal*, Vol. II, No. 56, p. 42. Westminster, 1921.

Prof. James Dryden has devised a method for the classification of hens as good, fair and bad layers. This method is based on the egg production ascertained by the use of trap-nets and by the study of the characters of the fowl.

Hens that cease laying and moult in July-August are not good layers, the same may be said of pullets laying few eggs their first year; such birds will not improve later and are therefore better eliminated.

Should nest-traps not be available, omission of laying is shown by: (1) shrivelling of the comb, wattles and auricles; (2) the narrow pelvis; (3) the contraction or induration of the abdomen; (4) in breeds having naturally yellow skin and legs, like the Leghorns and Plymouth Rocks, the brilliant hue of the legs and beak show that the hen has not laid for some weeks; (5) moulting.

In July, August and the beginning of September all fowls should be weeded out that: (a) are in an advanced stage of moulting, the comb and wattles being shrivelled; (b) have a contracted abdomen, or dry and wrinkled cloaca; (c) have yellow legs and beak. As a rule, symptom *a* is sufficient guide, but it is sometimes necessary to find it confirmed with *b* in order to be quite certain; *c* alone is not enough and this symptom must be associated with either *a* or *b*.

By adopting this method it is possible to reduce by 20 per cent the flock of average result without lessening the egg production. The better the feeding and general conditions, the more certain are the results obtained, for scarcity of food or a change in diet or environment may cause laying to cease, and make even a good layer begin to moult.

If it is desired to make a still more rigorous selection and to keep only fowls able to lay 200 eggs a year, hens must be chosen from October 15 to November 15, which have not completed moulting and possess (1) bright red wattles and comb, and quick eyes; (2) very broad pelvic bones, and elastic caruncle and abdomen; (3) pale legs, beak and cloaca, if the breed is one in which the skin and legs are naturally yellow. The present higher price of food renders the rigorous selection of the best laying hens more necessary and more profitable than before the war.

RURAL ECONOMICS

763.—**Cost of Producing Wheat on 481 Farms in the States of North and South Dakota, Minnesota, Kansas, Nebraska and Missouri for the Crop Year 1919.**—Cooper, M. R. and Washburn, R. S., in *United States Department of Agriculture, Bulletin* No. 943. Contribution from the office of Farm Management and Farm Economics, pp. 1-59, figs. 9. Washington, D.C., 1921.

The authors state that to be of real significance, cost figures must be presented in terms of the ranges that exist in the final cost per unit of production and in the various elements of cost. The variations in the cost per unit of production in any representative farming area are so marked that they should be considered in any case where cost figures are concerned. From the presentation of the range of costs of farm products, it would appear that usually from 40 to 50 per cent of the production involves expenditure above the average. It follows that the cost that will cover the "bulk" of the production of a given product is the figure that approximates to what the price should be to maintain the industry. This consideration has led to the consideration of the "bulk-line" theory which has recently assumed an important place in the discussion of the relation of production costs to price. The "bulk-line" theory is a modification and an attempt at practical application of the "marginal cost" or "greatest-cost" theory of the relations of cost and price. In practice, the "bulk-line" has sometimes to be drawn to include 85 per cent of the production, but this is merely a tentative and more or less arbitrary figure.

In reality the position of the "bulk-line" varies with different commodities and from time to time, according to alertness with which farmers adjust their production to market conditions. The "bulk-line" cost corresponds to the long-period average

price which is essential, one year with another, to stimulate the production of the amount of product which the market demands. What this "bulk-line" cost will be depends upon a number of factors, including the rate the farmer must pay for land, labour and capital, and the standard of living which farmers, as a class, insist upon if they are to remain on the farm.

The purpose of the present bulletin is to give a statement of facts concerning the cost of wheat production for the area and season covered by the survey; United States western and northern plains and the crop year 1919.

Tabulated cost data were obtained from 481 records, of which 197 were made in five representative counties of the principal spring-wheat states, North and South Dakota and Minnesota, and 284 in nine counties in Kansas, Missouri and Nebraska, important winter-wheat states, and furnish the basis of this analysis of the average cost and variation in cost on individual farms and groups of farms in each area visited, as well as the more important reasons for the great variations in cost per acre and per bushel on individual farms. A total area of 43,940 acres sown with winter wheat, yielding 635,124 bushels and a total area of 44,218 acres seeded for spring wheat, with a total production of 362,047 bushels for the crop year 1919, were involved. The results are summarized as follows:—

Cost per acre: Spring wheat, $12.98 to $47.84; average, $22.40; winter wheat, $10.55 to $50.23; average, $27.80.

Cost per bushel: Spring wheat, $1.15 to $14.38; average, $2.65. Winter wheat, $0.96 to $8.24, average $1.87.

Yield: Spring wheat, 20·8 bushels per acre to less than one bushel; average, 8·4. Winter wheat, 30 bushels per acre to 2·2 average, 15.19.

The average yield of spring wheat was 9 bushels per acre in the United States as a whole in the same year, 1919, and the average yield for all winter-wheat in 1919 was 14·7 bushels per acre. The largest number of spring-wheat farms fell within the group having a yield of from 5 to 10 bushels per acre, while the largest number in the winter-wheat districts were included in the group having a yield of from 15 to 20 bushels.

The difference between the gross cost and the sum of credits for pasture and any straw utilized on the farm is taken to be the net cost of producing wheat. The average cost expense of each item was computed on a basis obtained by dividing the total cost of each item by the total wheat acreage. An analysis of the total cost for spring and winter wheat shows that labour accounts for about 32 to 35 per cent of the total cost of production, threshing about 8 per cent, materials from 10 to 17 per cent, land rent from 24 to 30 per cent and other costs from 17 to 19 per cent. The difference in cost per bushel of producing spring and winter wheat is due to a lack of relation between the cost of producing an acre of wheat and the yield obtained, the cost per acre of winter wheat being 24 per cent greater than for spring wheat. In the spring wheat area about 33 per cent of the production was on the farms having cost above the average; in the winter wheat area, about 40 per cent of the production was on farms having costs above the average.

Summaries of costs by districts, range in cost per acre by counties, net cost per bushel, variations in items of cost, area of farms according to cost per bushel by counties, cumulative percentage of acreage grown at various bushel costs, cumulative percentage of total production, and individual costs per acre are tabulated and discussed.

AGRICULTURAL INDUSTRIES

498.—Variations in the Percentage of Fat in Successive Samples of Cows Milk.— RAGSDALE, A. C., BRODY, S., and TURNER, C. W., in *Journal of Dairy Science*, Vol. X, No. 5, pp. 448-450. Baltimore, September, 1921.

The fact that successive samples of milk drawn from a cow gradually increase in fat content, has long been known and was formerly explained by supposing that the fat being lighter rose to the top of the milk cistern and ducts.

This gravity theory was however discarded as a result of the observations of HEIDENHAIN, who found that the difference in the volume of the udder before and after the evacuation of milk is much below the volume of milk given by a cow during one milking, and consequently inferred that a large part of the milk is secreted during the process of milking. The authors describe their own experience which may contribute to an explanation of the phenomenon. The right front quarter of a Jersey cow producing 20 pounds of milk per day was milked under the following conditions:

Amount of Fat in Successive Fractions of Milk

Sample No.	Cow			Cylinder	
	Immediately on coming into barn	After standing 2 hours	Standing 2 hours and manipulation	After standing 1½ hours	After standing 3 hours
	Per cent	Per cent	Per cent	Per cent	Per cent
1	3·1	1·4	6·3	4·4	1·6
2	3·2	1·5	6·1	5·4	2·7
3	4·7	1·9	6·4	5·7	3·6
4	5·4	3·0	6·5	5·8	4·2
5	5·9	3·4	6·5	5·9	4·9
6	6·9	4·1	6·8	6·0	5·4
7	6·9	4·8	7·2	6·0	5·9
8	6·5	7·8	7·5	6·3	6·8
9	6·8	11·0 (about)	8·2	6·7	12·0

(1) Immediately on coming into the barn from the pasture, (2) after standing quietly in the barn for two hours; (3) after standing in the barn for two hours followed by a thorough massaging and manipulation of the udder for a few minutes for the purpose of mixing the milk within if possible. The milk in each case was milked into a 100 cc. cylinder and fat determined in each of the 100 cc. fractions. For comparison determinations were made of the variations of fat in successive 100 cc. of milk drawn from the cylinder of the usual dimensions after standing respectively for 1½ and 3 hours. The results given in the table show that, within given limits, the longer the cow stands quietly the greater the variation in the fat content of the successive fractions of the milk. The curves of variation in the cylinder and udder are strikingly similar.

502.—**Connection Between the Number of the Bacteria in the Milk and the Quality of the Cheese Obtained.**—Hucker, G. J., in *New York Agricultural Experiment station, Geneva, Bulletin No. 486*, pp. 19. Geneva, New York, 1922.

This paper is the first of a series on the bacteriology and ripening of cheeses and the connection between this ripening and the bacterial flora of the milk. The data upon which this study is based were collected during the winter of 1920 in a cheese-factory near Philadelphia where whole milk Cheddar cheese of the "Young American" type were manufactured. The counts of the bacteria present in the milk were made on samples taken from the milk supplied by 25 members of the cheese factory and on samples taken from the curd, in each case the number of bacteria was estimated from the acidity.

It was found that there is no connection between the bacterial content of the milk and number of molds developed to ripe cheese, although milk with the maximum of bacteria (12 to 13 millions per c.c.) tends to make better cheese of a texture more open, whereas milk with few bacteria produces cheese of inferior quality.

The number of bacteria present in the milk does not appear to have any effect upon the amount of cheese produced.

The character of the species of bacteria in the milk intended for cheese-making is of much greater importance than their number; hence milk intended for the cheese factory should not be judged from the bacteriological standpoint in the same manner as milk to be drunk in its natural condition.

PLANT DISEASES

872.—**Decree of July 13, 1922, Prohibiting the Entry Into France and the Transit of Potatoes and Their Leaves and Refuse Coming From the United States and Canada.**—*Journal Officiel de la Republique Francaise*, Year LIV, No. 189, p. 7418.

Art. I.—The entry and transit in France of potatoes, and their leaves and refuse coming directly or indirectly from the United States and Canada, countries where the existence of *Doryphora decemlineata* of Colorado has been ascertained, are prohibited. This prohibition also applies to boxes, barrels, sacks or other packing in use or having been used in the transport of the above-mentioned produce.

Art. II.—The prohibition contained in Art. I above will be applicable also to consignments of fresh fruits and vegetables other than potatoes and their leaves and refuse, as well as to material used in their transport and packing, when the presence of *Dor. decemlineata* has been ascertained on such consignments.

To give effect to this measure, the said consignments will be specifically examined for the purpose on arrival in France.

509.—**Sulphate of Iron and Perchloride of Iron in the Treatment of Chlorosis of the Vine.**—Lerichelle, E., in *La Propaganda Agricola*, Series II, Year XIII, No. 15, pp. 206-209. Bari, 1921.

In treating "chlorosis" of the vine with sulphate of iron it is necessary according to the author, to insure that this salt exerts

a rather prolonged action on the root system of the host plant. For this reason, instead of applying a solution of iron sulphate to the soil around the diseased vine, it is better to use it in the form of powder which should be well mixed with soil and spread around the vine-stock at a distance of 20 to 24 inches. The soil is then lightly watered for some days which causes the salt to dissolve gradually and provide the roots with a constant supply of weak solution, which will not become too concentrated. For this treatment 250 to 300 gm. of sulphate iron are sufficient.

Better experimental results, as regards efficacy, rapidity and economy, were obtained by the author in the treatment of chlorosis with perchloride of iron than with sulphate of iron if very dilute solutions were employed.

The author advises that perchloride of iron be prepared and applied in the following manner.

A 2 per cent solution is made by adding 10 to 12 gm. of perchloride of iron to 5 or 6 litres of water. This mixture is poured into a circular trench dug around the vine-stock at a distance of from 20 to 24 inches in order to get as near as possible to the roots and the trench is afterwards filled in with soil.

By the adoption of this method severely infected vines have been permanently cured, whereas others which were treated with sulphate of iron and appeared to have recovered became chlorotic again after some time had elapsed.

522.—**On the Etiology of the Potato Disease Known as Tip-Burn, in the United States.**—EYER, J. R., in *Science*, New Series, Vol. IV, No. 1416, pp. 150-151. Utica, N.Y., February 17, 1922.

Researches have been made of recent years at the Experimental Station of Pennsylvania State College with the object of determining the etiology and specific cause of the potato disease called tip-burn due to the attack of *Empoasca mali*.

The experiments were carried out in the form of a series of inoculations with aqueous and alcoholic extracts of the Rhynchote and other insects living at the expense of the potato. The inoculated plants were placed in special cages and exposed to sunlight of different degrees of intensity in order to determine how far sunlight influences the development of the disease.

The results obtained led to the following conclusions:

(1) Tip-burn of the potato can be induced by means of an extract obtained by maceration of the nymphs or adult forms of *E. mali* and is transmissible by direct inoculation; this indicates the presence of some specific substance, either inherent or of external origin and transmitted by the Rhynchote which is the actual cause of the disease.

(2) The active principle of this substance is more energetic in the nymph stage of the Rhynchote.

(3) The specific substance is present in the tissues of the diseased leaf after inoculation with the Rhynchote extract and can be transmitted by reinoculation to healthy plants.

(4) This substance is of a definite nature and the disease cannot be induced by inoculation with extracts of insects other than *E. mali*, or by mechanical injury.

(5) Sunlight plays an important part in the progress of tipburn after it has once begun, but the absence of sunlight does not prevent its appearance.

OTHER ARTICLES ON SCIENCE AND PRACTICE OF AGRICULTURE

On account of lack of space the following articles in the International Review of the Science and Practice of Agriculture can only be referred to. Anyone desiring the articles may obtain them from the Institute Branch, Department of Agriculture, Ottawa.

362.—**Fleas and the Methods of Their Control.**—I. BISHOPP, F. C., Fleas and Their Control, in *Farmers' Bulletin 897, United States Department of Agriculture*, 11 pp. Washington, 1921. II. DELANSE, P., Au sujet d'un piège à puces, in *Bulletin de la Société de Pathologie exotique*, Vol. XV, No. 1, pp. 39-41. Paris, January 11, 1922.

370.—**Studies on the Reduced Yield of the Chief Farm Crops, Especially as Caused by Adverse Weather Conditions in the United States.**—VALGREN, V. N., in *U.S. Department of Agriculture, Bulletin No. 1043, Office of Farm Management Farm Economics*, pp. 1-29. Washington, January, 1922.

376.—**Preparation of Soil Solution.**—GREAVES. J. E., and HIRST, C. T., in *The Journal of Agricultural and Engineering Chemistry*, Vol. XIV, No. 3, pp. 224-226, bibliography of 23 works. Washington, March 1, 1922.

452.—Study on Horse Breeding in the United States.—HARPER, M. W., in *Cornell University Agricultural Experiment Station, Bulletin No. 403*, 49 pp. Ithaca, New York, 1921.

455.—New Methods of Judging Cattle.—KOPPE, Das ostfriesische und provinzial-sachsische Korverfahren; II. CORNELIUS, Das oldenburgische Korverfahren; III. Das Jeverlander Korverfahren; in *Deutsche landwirtschaftliche Tierzucht*, Year XXV, No. 17, pp. 170-171. Hanover, April 1921. IV. COWEN, J. W., Studies on conformation in relation to milk-producing capacity in cattle, in *Journal of Dairy Science*, Vol. IV, No. 5, pp. 359-374. Baltimore, September 1921. V. MARCQ, J., Institut Agronomique de Gembloux and MAHY, M., Des modes d'appreciation du bétail dans les concours et du type idéal bovin à rechercher en Belgique, in *Annales de Médecine Vétérinaire*, Year XLVI, Nos. 8-9, pp. 337-364. Ixelles-Brussels, August-September, 1921. VI. COLOMBE, M., Appréciation des qualités beurrières et laitières chez les vaches, in *Journal d'Agriculture Pratique*, Year LXXXV, No. 44, pp. 377-379, and No. 45, pp. 391-393. Paris, November, 1921.

459.—Lamb-Fattening Experiments in the United States.—I. HAMMOND, J. W., Green forage crops and corn for fattening lambs, in *Bulletin of the Ohio Agricultural Experiment Station, No. 340*, pp. 35-99. Tables 28, figs. 16. Wooster, Ohio, 1920.—II. PATERSON, A. M., and WINCHESTER, N. B., Lamb Feeding Investigations, 1919-1920, in *Agricultural Experiment Station, Kansas State Agricultural College, Manhattan, Kansas, Circular 88*, pp. 6, fig. I. Topeka, 1921.

490.—Cost of Milk Production in Some of the States of North America.—I. COMBS, S., and BAIN, J. B., A study of the factors involved in producing milk in North Carolina, in *North Carolina Department of Agriculture Bulletin*, Vol. 41, No. 5, pp. 30. Raleigh, 1920. II. BAIN, J. B., and POSSON, R. J., Requirements and Cost of producing market milk in Northwestern Indiana, in *United States Department of Agriculture Bulletin No. 853*, pp. 31. Washington, 1920. III. BAIN, J. B., and BRAUN, G. E., Unit Requirement for Producing Milk in Western Washington, *Ib. Bulletin No. 919*, pp. 19, 1920. IV. BAIN, J. B., and POSSON, R. J., Unit requirements for Producing Market Milk in Vermont, *Ib. Bulletin*, No. 923, pp. 18, tabl. 12. 1921. V. BAIN, J. B., BRAUN, G. E. and WOOD, W. D., Unit Requirements for Producing Market Milk in Southeastern Louisiana, *Ib. Bulletin*, No. 933, 1921.

547.—Experiments With Potash Fertilizers in the United States.—I. SMITH, R. S. Some effects of potassium salts on soils, in *Cornell University Agricultural Experiment Station, Memoir 35*, pp. 571-605. biblio. Ithaca, N.Y., 1920. II. PARR, S. W., and AUSTIN, M. M., Potash Shales of Illinois; KREY, F., Geology Distribution, and Occurrence of the Potash-Bearing Shale of Union County; STEWART, R., Finely-Ground Shale as a source of potash for soil improvement, in *University of Illinois Agricultural Experiment Station Bulletin, No. 22*, pp. 227-252. Urbana, Ill. 1921.

551.—Methods of Colloidal Chemistry in Plant Physiology, Sensitiveness of Lupins to Alkaline Earth Metals.—BOAS, F. and MERKENSCHLAGER, F., in *Centralblatt fur Bacteriologie*, II. Abb., Vol. 55, Nos. 21-24, pp. 508-214. Jena, 28th Feb., 1922.

563.—Means of Obtaining, by Suitable Crossing, Varieties of Grapes Without Pips.—STOUT, A. B., in *New York Agricultural Experiment Station*, Geneva, N.Y., Technical Bulletin No. 82, pp. 1-16. Plates i-vii. Geneva, N.Y., January 1921.

603.—Thirty Year's Experimental Stock Breeding in Utah.—HARRIS, F. S., and BUTT, N. J., in *Utah Agricultural Experiment Station, Circular No. 46*, 64 pp. Loban, Utah, 1921.

637.—Investigations on Milking Machines: Their Efficiency, Advantages in Labour Saving, and Their Sterilization.—WOLL, F. W., Investigations with milking machines, in *California University Agricultural Experiment Station*, Bulletin 311, pp. 31-34, 3 fig. Berkeley, 1919.—II. RIDDEL, F. T., Machine *versus* Hand Milking in *Michigan Agricultural Experiment Station, Quarterly Bulletin*, v. 1, No. 4, pp. 163-164. East Lansing, 1919.—III. BREED, R. S., Methods of Caring for Milking Machines Tubes, in *Journal of Dairy Science*, v. V. No. 1, pp. 102-109, bibliography of 15 works. Baltimore, Jan. 1922

643.—Manufacture of Cheese of the Roquefort Type With Cows Milk in the United States.—MATHESON, K. J., in *United States Department of Agriculture, Bulletin 970*, pp. 28, figs. 11. Washington, 1921.

685.—The National Agricultural Conference in the United States.—*Journal of Farm Economics*, Vol. IV, N. 1, p. 61-63. Lancaster, Pa., Jan. 1922.

686.—The Smithfield Club Show in London and Its Lessons.—I. *Live Stock Journal*, Vol. XCIV, No. 248, pp. 583-593. London, December 9, 1921. II. VOITELLIER, Ch. and GRAN, A., in *Revue de Zootechnie*, No. 4, pp. 299-321. Paris, January 1922.

690.—**Depth for Sowing Grass and Clover Seed.**—WILLIAMS, R. D., in *The Journal of the Ministry of Agriculture*, Vol. XXIX, No. 1, pp. 53-60 and No. 2, pp. 132-137. London, April-May, 1922.

728.—**Poisoning of Cattle by the Prussic Acid in Sorghums.**—VINALL, H. N., in *Journal of the American Society of Agronomy*, Vol. 13, Nos. 6-7, pp. 267-280. Bibliography of 22 works. Lancaster, Pa., and Washington, D.C., Oct. 15, 1921.

737.—**The Mannitol-Producing Organisms in Silage.**—PLAISANCE, G. P., and HAMMER, B. W., in *Journal of Bacteriology*, Vol. 6, No. 5, pp. 431-433, bibliography of 7 works. Baltimore, Sept. 1921.

742.—**The Proportions of the Trotter.**—VAN MELDERT, L., in *Annales de Gembloux*, Year 25, Book 6, pp. 198-208. Brussels, June 1922.

751.—**Effect of Rationing on the Development of Pigs.**—SWANSON, C. O., in *Journal of Agricultural Research*, Vol. XXI, No. 5, pp. 270-341. Bibliography of 11 works. Washington, D.C., June, 1921.

758.—**Poultry Feeding Methods Employed by Experiment Stations in the United States.**—ATWOOD, H. in *The National Poultry Journal*, Vol. II, No. 56, pp. 41-42. London, 1921.

764.—**The Cost of Production of Wheat, Beet, Potatoes and Milk in France.**—GIRARD, H., in *Bulletin de la Société des Agriculteurs de France, Supplément du Bulletin d'Avril 1922, Comptes-rendus de l'Assemblée Gênêrale de 1922*, Section 2, pp. 39-45. Paris, 1922.

774.—**Dairy Products Investigation. Projects Carried on by the Agricultural Experiment Stations in the United States.**—POTTS, R. C., in *Journal of Dairy Science*, Vol. IV, No. 5, pp. 416-428. Baltimore, 1921.

776.—**The Preservation of Forage by Means of Electric Current.**—*Rapport présenté par l'Administration centrale des Etablissements fédéraux d'essais et d'analyses agricoles de Liebefeld près Berne.* April 4, 1922, pp. 1-8.

THE INTERNATIONAL REVIEW OF AGRICULTURAL ECONOMICS

The following is a brief indication of the contents of the more important articles in the November and December numbers of the Institute Bulletin. Persons interested in any of the articles may obtain the original Bulletin on application to the Institute Branch, Department of Agriculture, so long as the supply for distribution is not exhausted.

New Agricultural Organizations in Austria.—6 pages. After the war there appeared in Austria a tendency to the creation of associations representing the agricultural profession in the separate provinces of the confederation. The new organizations discussed in this article are: the vocational agricultural organizations in the Tyrol; the Chamber of Agriculture of Lower Austria; and The Chamber of Agriculture of Styria.

War and Post-War Rural Credit Measures in the United States—12 pages. The subject is discussed under four heads: The War Finance Corporation, The Federal Loan System, seed grain loans, and miscellaneous measures, including rural credit measures taken by certain of the States.

The National Committee for the Embellishment of Rural Life in Belgium.—6 pages. The National Committee owes its origin to the very general interest shown in the agricultural section of the "Modern Village" exhibited at the World International Exhibition held at Ghent in 1913. The article describes the success achieved by the Committee, which hopes to put a check on rural exodus.

Other articles in the November number are: The First Co-operative Grain Elevators in Algeria; Co-operative Forestry Societies in Roumania; The Assessment of Losses Caused by Forest Fires in France; The Maintenance of the Agricultural Labour Supply in Ireland During the War; The Agricultural, Social and Financial Policy of the "Opera Nazionale Per I Combattenti" of Italy.

Articles in the December number of the Institute Economic Bulletin are: The Saragossa Farmers' Association; The Enquiry of the Swiss Peasants' Secretariate into Agricultural Association and Co-operation in 1920; The Maintenance of The Agricultural Labour Supply in Germany during the War (55 pages); Land Policy in Russia.

AGRICULTURAL STATISTICS

FOREIGN CROP CONDITIONS

(April 18th, 1923)

Conditions in February.—Almost throughout Europe, February was characterized by heavy rains and mild temperature. No frost damage was reported except in western Poland. Excessive moisture caused a yellowing of plants in some districts of France and England, but, generally speaking, the month was favourable for winter crops, and their condition at the beginning of March was in the main a good one. The rains caused such saturation of the soil as to stop the preparatory work for spring sowing, so that in most countries sowing was not begun when March set in. In North Africa the month was propitious for winter crops, and they showed good promise.

Conditions generally in March.—In the first part of the month conditions in Europe were fair to good except that there was too much rain in the western countries. By the middle of the month the weather was much better and the crops generally satisfactory. In the last part of the month conditions continued to improve.

United Kingdom.—The weather was generally fine in the last part of March. Work on the land, which had fallen somewhat behind on account of the rains earlier in the season, had made a good recovery. Winter wheat and oats were of excellent promise on the first of April.

France.—The weather was fine during the last half of March. Spring sowing proceeded with great activity. There is a ten per cent increase in the winter wheat acreage. Soil conditions are favourable.

Germany.—Weather conditions improved in March. Spring work was behind, but winter crops were reported satisfactory.

Italy.—Spring sowing was proceeding amid favourable surroundings. Winter crops were in good condition.

Spain.—Winter crops were considerably damaged by drought, but their condition was improved by rains in the last week of March.

Hungary.—Wet weather delayed spring cultivation, but the condition of winter crops was satisfactory.

North Africa.—The crop outlook was generally satisfactory at the beginning of April. Drought had retarded the crops in some districts.

Australia.—The moisture supply has not equalled expectations. There is great need for more rain in order to put the soil in a satisfactory condition for seeding.

Argentina.—Soil conditions are favourable for the seeding of the new crops.

AREAS SOWN TO WINTER WHEAT AND RYE

	Wheat			Rye		
	1923	1922	1917-21	1923	1922	1917-21
	Acres	Acres	Acres	Acres	Acres	Acres
	328,000	305,000	298,000	475,000	540,000	535,000
	2,445,000	2,189,000		401,000	418,000	
	10,[illegible]00	9,927,000	10,134,000	1,701,000	1,737,000	1,994,000
	22,000	22,000	18,000	578,000	578,000	592,000
	11,[illegible]00	11,863,000	11,906,000	2,149,000	2,054,000	2,128,000
	11,[illegible]00	11,488,000	11,071,000	321,000	321,000	315,000
	[illegible]00	2,408,000		11,476,000	11,163,000	
	[illegible]00	5,979,000	4,744,000	456,000	482,000	667,000
	[illegible]00	5,[illegible]00				
	1,[illegible]00	1,367,000	1,409,000	2,054,000	2,137,000	2,211,000
	[illegible]00	99,000	96,000			
	39,[illegible]00	41,611,000	44,814,000	5,508,000	6,210,000	5,128,000
	29,[illegible]00	28,930,000	28,862,000			
	[illegible]00	3,018,000				
	1,[illegible]00	1,[illegible]00				
	129,656,000	128,576,000				

THE WHEAT CROP OF INDIA

A cablegram from the International Institute of Agriculture states that the newly harvested wheat crop of India is 425,000,000 bushels compared with 366,000,000 last year, and 344,600,000 the average of the five years 1916-20. This crop was harvested on 29,511,000 acres compared with 28,234,000 last year. It is a record crop for India. In the decade 1899 to 1908 the average area sown to wheat was 25,000,000 acres, and the average production 275,000,000 bushels.

The condition of the cereal crops in Europe and North Africa on April 1st is reported by the Institute as generally good.

The final estimate of the 1922 production of wheat in France is 243,240,000 bushels against 323,000,000 in 1921. Previous estimates gave the 1922 crop as 235,000,000 bushels.

THE UNITED STATES APRIL CROP REPORT

The 1923 winter wheat crop is estimated by the U.S. Department of Agriculture at 572,317,000 bushels, the smallest crop since 1918, and 17,537,000 bushels less than the average production for the past 10 years. The forecast is based on conditions prevailing April 1st and upon the assumption of average abandonment of acreage through the winter and average influences from now until harvest.

No estimate was made of the abandoned acreage, which will be indicated in the May crop report, but the Department says that abandonment promises to be heavy, although irregular, from Ohio westward to Kansas and Nebraska.

Owing to the extensive drouth or scanty rainfall last fall and winter in many sections, much wheat failed to germinate or, barely germinating, perished from the rigours of winter. In the plains area, extending from western Nebraska through western Kansas into the panhandle region of Oklahoma and Texas, conditions are extremely poor, ranging from 50 per cent downward to complete failure. These conditions extend with lessening severity over the adjacent half of Nebraska, the western half of Kansas, practically all of the Texas panhandle, eastern New Mexico, eastern Colorado, and southwestern Wyoming, in all of which territory the condition is below 65 per cent.

The area sown to winter wheat last fall was about 1,500,000 acres less than sown in the fall of 1921, the total having been 46,069,000 acres for this year's crop, compared with 47,611,000 last year. The abandoned acreage last year amounted to almost 5,500,000 acres, and indications are that it will be more extensive this year.

This year's rye production was forecast at 75,784,000 bushels, which is almost 20,000,000 less than last year's crop, the third largest ever grown.

THE WORLD'S CORN CROP COMPARED WITH PRE-WAR FIGURES

The International Institute of Agriculture reports that in Europe, not taking into consideration present Russian territory—where this crop is however of limited importance—the diminution in the yield for 1922 has been, in proportion, greater for corn than for any other cereal crop. In fact, the European yield in 1922 was estimated at equal to but 62 per cent of the average for the period 1909-1913. Even when compared with 1921, the yield in 1922 shows a decrease.

Also, in the United States, which furnish 75 per cent of the world's total production of corn, the yield in 1922 was below (by about 6 per cent) that of 1921, although showing an increase of 7 per cent over the pre-war average. The results indicated above may be seen from the following figures showing the aggregate productions of Europe and North America.

(Production In Thousand Bushels)

Countries	1922	1921	Average 1909-1913
European countries	347,142	397,320	559,106
United States and Canada	2,904,510	3,083,473	2,725,529
Totals	3,251,652	3,480,793	3,284,635

For a group of countries, therefore, which supply about 90 per cent of the world's total corn production, the yield in 1922 was 7 per cent below that of 1921, and 1 per cent below the average for the pre-war period 1909-1913.

Argentina, one of the world's large corn-producing countries, does not figure in the above table, as the harvest in this country has only just begun. The yield appears likely to be considerably below that of last year in spite of the increase in the area cultivated.

The areas under crop and the yields per acre in the year 1922, as compared with those of 1921 and the averages for the five-year period immediately precedent to the war, are indicated, in the following table, for Europe and for North America.

AREAS, AND YIELDS PER ACRE

Countries	Areas (in thousand acres)			Yields (in bushels per acre)		
	1922	1921	Average 1909-1913	1922	1921	Average 1909-1913
Europe	22,975·2	23,188·7	24,250·5	15,2	17·1	23·0
United States and Canada	102,748·9	104,039·3	104,540·7	28·2	29·6	26·1
Totals and averages	125,724·1	127,228·0	128,791·2	25·9	27·3	25·5

For Europe, a certain decrease is to be noted in the area cultivated in 1922, together with a large diminution in the yield per acre; whilst in North America the area cultivated has remained very much the same as compared with the 1909-1913 average, and the yield per acre shows a considerable increase.

IMPORTS AND EXPORTS OF WHEAT AND FLOUR

(Flour reduced to equivalent quantities of wheat)

Countries	January		Six months (August 1st to January 31st)	
	1923	1922	1922-23	1921-22
	Bushels	Bushels	Bushels	Bushels
Exports—				
Hungary	282,000	1,778,000	2,904,000	6,270,000
Roumania	126,000	76,000	1,240,000	2,478,000
Canada	14,354,000	8,946,000	190,447,000	118,788,000
United States	12,519,000	14,982,000	142,408,000	180,728,000
Argentina	12,583,000	9,687,000	45,644,000	18,678,000
India	2,618,000	252,000	7,454,000	1,655,000
Australia	8,818,000	13,647,000	17,214,000	52,146,000
Russia	.....	183,000	577,000	4,685,000
Danube	12,000	58,000	150,000	1,623,000
Other countries	30,000	230,000	1,361,000	1,938,000
Total exports	51,342,000(a)	49,839,000	408,822,000 (a)	388,989,000
Imports—				
Germany	2,209,000	3,081,000	25,197,000	44,433,000
Austria	.....	1,654,000	5,834,000	10,768,000
Belgium	3,402,000	6,173,000	20,488,000	26,885,000
Denmark	579,000	157,000	2,958,000	2,514,000
Finland	315,000	131,000	2,323,000	1,371,000
France	.....	408,000	20,302,000(c)	15,572,000
United Kingdom and Ireland	21,335,000	11,682,000	112,764,000	102,776,000
Greece	1,837,000	989,000	7,620,000	6,120,000
Italy	9,318,000	12,063,000	47,171,000	56,316,000
Netherlands	561,000	573,000	3,860,000	3,508,000
Poland	2,492,000	1,331,000	14,881,000	12,080,000
Sweden	80,000	21,000	218,000	420,000
Switzerland	396,000	229,000	4,270,000	2,769,000
Czecho-Slovakia		867,000	6,607,000	8,568,000
Other countries	708,000	706,000	3,808,000	7,144,000
Total imports	574,000	2,416,000	5,192,000	10,205,000
Visible supply	751,000	313,000	3,213,000	4,110,000
Afloat for countries	199,000	129,000	1,198,000	1,291,000
Total imports	44,756,000 (b)	42,923,000	255,168,000 (b)	316,850,000

(a) Not including Russia. (b) Not including Austria, France and Switzerland. (c) Five months only.

INDEX NUMBERS OF THE PRICE OF WHEAT

Dates	Exporting Markets				Importing Markets					
	Canada Winnipeg — No. 1 Manitoba	*United States* Chicago — No. 2 Winter	*India* Karachi — Karachi White	*Argentina* Buen. Aires — Barletta	*Germany* Berlin — Home grown	*Belgium* Antwerp — Home grown (Markischer)	*France* Paris — Home grown	*Great Britain* London — Home grown	*Italy* Milan — Home grown soft	*Netherlands* Rotterdam — Home grown
Average 1913	100	100	100	100	100	100	100	100	100	100
14 March 1913	97·4	98·3	108·0	91·3	99	99·7	101·1	97·9	106·3	84·9
10 " 1922	158·5	145·7	nq.	159·0	6,611	320·7	254·5	157·3	416·4	140·2
5 January 1923	121·7	132·1	139·9	137·0	167,924	343·4	300·7	116·7	395·0	113·8
12 " 1923	123·6	133·8	141·6	136·4	195,073	353·5	302·5	118·7	391·5	113·8
19 " 1923	124·3	133·5	139·9	138·2	367,019	363·6	311·5	122·9	391·5	117·8
26 " 1923	123·0	127·4	137·5	137·6	404,726	388·9	320·5	120·8	391·5	117·3
2 February 1923	122·9	129·6	130·5	138·2	633,484	416·7	321·4	118·7	391·5	114·5
9 " 1923	125·1	136·3	129·7	139·3	676,219	399·0	322·7	118·7	389·7	112·2
16 " 1923	127·1	134·6	128·9	140·5	462,544	404·0	332·6	117·7	395·0	114·8
23 " 1923	126·0	131·6	129·7	138·7	568,125	399·0	323·2	117·7	395·0	108·2
2 March 1923	126·3	132·7	127·3	138·7	447,461	404·0	337·1	119·8	395·0	107·4
9 " 1923	126·0	133·0	128·1	137·0	372,046	404·0	342·0	118·7	398·6	106·2

PRICES AND OCEAN FREIGHT RATES REDUCED TO CENTS

PRODUCTS, MARKETS AND DESCRIPTIONS	2 Mar. 1923	2 Feb. 1923	3 Mar. 1922	Aver. 1913
WHEAT (*cents per 60 lbs.*)				
Canada:				
Winnipeg: No. 1 Manitoba	109	107	143	88
United States:				
Chicago: No. 2 Winter	119¾	117	140	90½
Minneapolis: No. 1 North	123	121	155⅞	88¾
New York: No. 2 Winter	132¾	129¼	153	97¼
India:				
Karachi: Karachi white	113	116	n.q.	91
Argentina:				
Buenos Aires: Barletta	122	120	140	100
Germany:				
Berlin: Home grown	106	82	145	129
Belgium:				
Antwerp: Home grown	116	155	148	104
France:				
Paris: Home grown	155	144	178	146
Great Britain:				
London: English	121	119	158	104
Liv. and Lond: No. 1 Man	135	131	180	110
Liv. and Lond.: No. 2 Win	134	132	n.q.	109
Liv. and London: Pacific	143	151	165	111
Liv. and London: Plate	132	131	167	108
Liv. and London: Australian	141	143	163	117
Liv. and London: C. W. Kar	139	140	n.q.	110
Italy:				
Milan: Home grown soft	145	141	171	148
Netherlands:				
Rotterdam: Home grown	114	121	146	108
RYE (*cents per 56 lbs.*)				
United States:				
Minneapolis: No. 2	76½	80½	99	63⅝
Germany:				
Berlin: Home grown	94	68	105	99
Belgium:				
Antwerp: Home grown	89	84	125	82
France:				
Paris: Home grown	112	107	113	97
Netherlands:				
Rotterdam: Home grown	97	101	124	90

OCEAN RATES OF FREIGHT AND VOYAGES	2 Mar. 1923	2 Feb. 1923	3 Mar. 1922	Aver. 1913
OCEAN RATES OF FREIGHT (WHEAT AND MAIZE) (*cents per 100 lbs.*)				
Rumania:				
Danube to U.K.	16	16	22	11
Danube to Genoa	16	16	21	10
Canada:				
Canada to U.K.	15	15	18	14
United States:				
New York to Liverpool	7	8	16	10
North. Range to U.K. Cont	11	10	21	13
North. Range to Genoa	16	15	22	20
North Pacific Ports to U.K.	37	36	44	43
Argentina:				
Plate Down River-U.K.	20	21	30	18
Plate Up River-U.K.	20	22	32	20
India:				
Karachi to U.K.	25	24	24	20
Rangoon to U.K.	29	29	26	29
Australia:				
Australia to U.K.	42	42	52	34
COTTON FREIGHTS (*cents per 100 lbs.*)				
United States:				
New York to Liverpool	20	20	40	30
New Orl. to Liverpool	n.q.	n.q.	45	43

LIVE STOCK STATISTICS

GERMANY

Classification	Number		Increase(+) or decrease(−)	
	Dec. 1, 1922	Dec. 1, 1921	in number	per cent
Horses	3,647,977	3,665,982	−18,005	−0·5
Mules	26,193	27,315	−1,122	−4·1
Asses	5,226	5,633	−407	−7·2
Cattle	16,309,474	16,790,699	−481,225	−2·9
Sheep	5,566,086	5,891,029	−324,943	−5·5
Goats	4,135,950	4,295,548	−159,598	−3·7
Swine	14,682,622	15,817,819	−1,135,197	−7·2
Poultry	65,084,687	67,760,430	−2,675,743	−3·9
Rabbits	3,154,964	4,428,759	−1,273,795	−28·8
Bee-hives	1,829,095	1,930,382	−101,290	−5·2

SCOTLAND

Classification	Number		Increase(+) or decrease(−)	
	June 3, 1922	June 3, 1921	in number	per cent
Horses	211,402	216,621	−5,219	−2·4
Cattle	1,145,400	1,143,135	+2,265	+0·2
Sheep	6,671,453	6,658,511	+12,943	+0·2
Swine	150,386	145,498	+4,888	+3·4

IRELAND

Classification	Number		Increase(+) or decrease(−)	
	June 1, 1922	June 1, 1921	in number	per cent
Cattle	5,156,625	5,197,226	−40,601	−0·8
Sheep	3,566,521	3,708,264	−141,743	−3·8
Swine	1,036,726	977,152	+59,574	+6·1
Goats	250,443	261,204	−10,761	−4·1
Horses	544,464	554,863	−10,399	−1·9
Mules	25,784	27,006	−1,222	−4·5
Asses	232,438	229,648	+2,790	+1·2

ROUMANIA

Classification	Number		Increase(+) or decrease(−)	
	1921	1920	in number	per cent
Horses	1,686,728	1,485,200	+201,528	+13·6
Cattle	5,520,914	4,729,766	+791,148	+16·7
Buffaloes	200,256	145,858	+54,398	+37·3
Sheep	11,194,047	8,689,996	+2,504,051	+28·8
Goats	573,900	499,922	+73,978	+14·8
Swine	3,132,004	2,513,610	+618,294	+24·6

BELGIUM

Classification	Number		Increase(+) or decrease(−)	
	1922	1921	in number	per cent
Horses	230,451	222,055	+8,396	+3·8
Cattle	1,516,769	1,514,953	+1,816	+0·1
Swine	1,139,387	975,748	+163,639	+16·8

Directory of the Department of Agriculture

Minister.....The Honourable W. R. Motherwell.

Deputy Minister.....J. H. Grisdale, B.Agr., D.A.Sc.

Commissioner, Dept. of Agriculture.....Duncan Marshall.

Assistant Deputy Minister and Secretary ....Lt.-Col. A. L F. Jarvis, I.S.O.

The Dominion Experimental Farms, Director, E. S. Archibald, B.A., B.S.A.

Functions—To administer the Central Experimental Farm at Ottawa, twenty-one branch farms, eight sub-stations, eighty-six illustration stations, and two tobacco stations. The divisions of work are: Administrative, Chemistry, Horticulture, Cereals, Poultry, Animal Husbandry, Forage Plants, Bee, Tobacco, Botany, Field Husbandry, Flax, Illustration Stations, and Extension and Publicity.

Health of Animals Branch.....Veterinary Director General, Frederick Torrance, B.A., D.V.S.

Functions—To administer enactments for the protection of live stock from contagious diseases, and to inspect meats, meat products and canned foods; to conduct research work.

Live Stock Branch.....Commissioner, H. S. Arkell, M.A., B.S.A.

Functions—To develop the live stock industry through the use of superior stock; to improve marketing facilities; to administer The Live Stock and Live Stock Products Act.

Dairy and Cold Storage Branch.....Commissioner, J. A. Ruddick.

Functions—To develop the dairy industry; to inspect public cold storage warehouses; to carry on shipping experiments; to administer Dairy enactments.

Seed Branch.....Commissioner, George H. Clark, B.S.A.

Functions—To encourage the production and use of pure seed; to test and inspect seed; to inspect feed manufacturing plants; to inspect Fertilizers; to supply seed in case of shortage.

Entomological Branch.....Dominion Entomologist, Arthur Gibson, F.E.S., F.E.S.A.

Functions—To investigate injurious insects and methods of control; to enforce the Destructive Insect and Pest Act.

Fruit Branch.....Commissioner, G. E. McIntosh

Functions—To develop the fruit industry; to enforce the Inspection and Sales Act as it relates to fruit, fruit packages and potatoes; to enforce The Root Vegetables Act; to adjust transportation difficulties.

International Institute of Agriculture...Commissioner, T. K. Doherty, LL.B.

Functions—To represent Canada at the Internation Institute of Agriculture at Rome; to publish world agricultural information and statistics; to maintain the departmental library.

Agricultural Instruction Act Branch....Commissioner, (Acting), J. H. Grisdale, B. Agr., D.A.Sc.

Functions—To administer the Agricultural Instructional Act, and to report upon the work carried on by the provinces under its provisions.

Publications Branch.....Director of Publicity, J. B. Spencer, B.S.A.

Functions—To publish "The Agriculture Gazette';" to distribute departmental publications; to prepare and issue other publicity matter.